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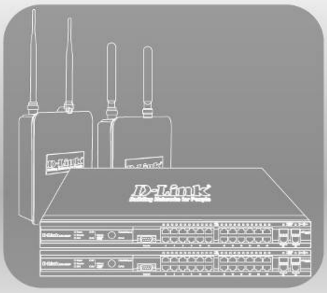

Unified Wired & Wireless Access System

Configuration Guide

Product Model: DWS-3000 Series,
DWL-3500AP/8500AP

Version 2.2

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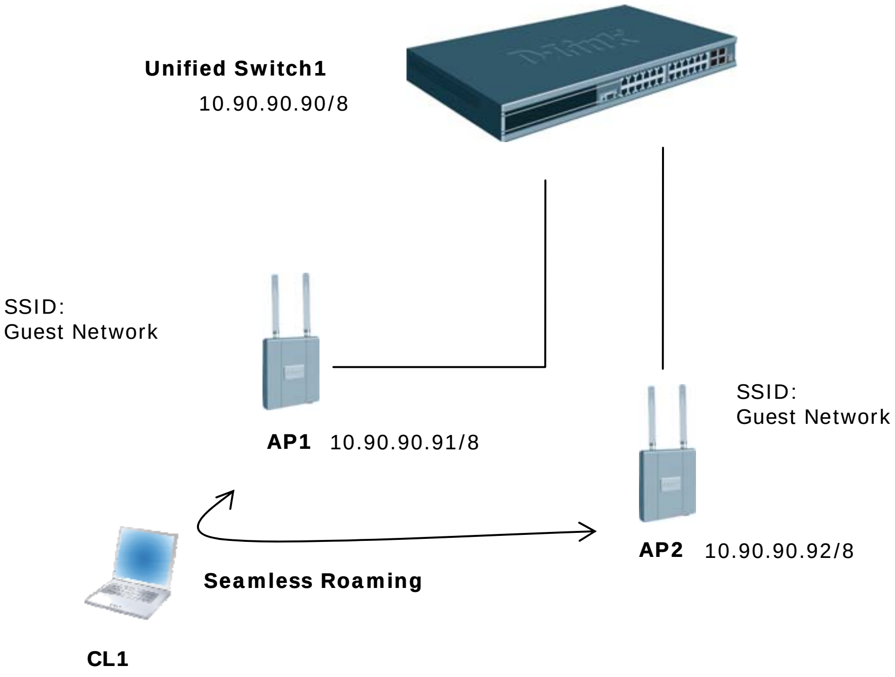
1. Scenario 1 - Basic L2 Edge Setup: 1 Unified Switch + 2 APs

The diagram in this scenario shows a very basic L2 edge network configuration with one Unified Switch and two access points. All devices are in the same L2 domain.

The objectives in this setup are as follows:

- Set up the minimum configuration for multiple APs
- Configure an AP with a static IP
- Configure an ACL to prevent wireless clients from accessing the Unified Switch1 management interface.
- Configure DHCP on the Unified Switch for wireless client address assignment.
- Understand some of the D-LINK Wireless Access Point features.



An overview of the configuration steps needed for Unified Switch and APs are as follows:

1. Disable DHCP on the APs and assign a static IP address to AP2.
2. Configure the Unified Switch1 DHCP server & address pool for Guest Network clients.
3. Configure an ACL to restrict access from clients on the Guest Network.
4. Attach the APs to Unified Switch1.
5. Validate the APs by adding them to the Valid AP database.
6. Save the configuration.
7. Perform tests.

The table below gives the IP addresses used in this scenario. The following steps will guide you through the configuration of the Unified Switch and the Access Point.

Device	**Subnet**
Unified Switch	10.90.90.90/8 (default)
AP1	10.90.90.91/8 (default)
AP2	10.90.90.92/8
Client Address Pool	10.90.91.1 – 10.90.91.254

To begin the Unified Switch configuration, connect to port 12 (or any other unused port) from a PC that is on the same subnet (10.0.0.0/8) and launch the web browser using this IP address, 10.90.90.90. The Unified Switches and the APs will be connected after completing the entire configuration.

NOTE: Do not power down the switch before saving configuration.
NOTE: The default username is “admin” and there is no password.

1.1 Configure AP Network Settings

DHCP client is enabled by default on the APs. However, for this scenario the APs use static IP addresses. For AP1, you can use the default static IP address of 10.90.90.91, but you must access the AP CLI to disable DHCP (otherwise, the AP would receive an address from the switch DHCP server, which you configure in section 1.1. For AP2, you must access the CLI to disable DHCP and to set a new static IP address so that it does not use the same IP address as AP1.

To access and configure AP1 and AP2 by using the access point CLI, use the following steps (Note: you will only have CLI access to the APs prior to them becoming managed by the Unified Switch. Once they reach managed state, the switch will disable CLI access to the APs such that a user cannot modify the configuration of the AP while in managed mode since in this mode the switch provides configuration information to the AP. It is possible to place a managed AP in “debug” mode in order to temporarily allow CLI access to the AP for configuration changes.)

1. Physically connect a PC in the 10.0.0.0 subnet to AP1.
2. Telnet to the AP by using the default IP address of 10.90.90.91. Use the default username/password of admin/admin.
3. Enter the following command to disable DHCP:
   ```
   set management dhcp-status down
   ```
4. Enter the command “save-running” to save the current AP configuration.
5. Physically connect a PC in the 10.0.0.0 subnet to AP2.
6. Telnet to the AP by using the default IP address of 10.90.90.91.
7. Enter the following command to change the IP address:
   ```
   set management static-ip 10.90.90.92
   ```
8. Telnet to the AP again by using the IP address of 10.90.90.92 since your initial session will be dropped upon changing the address.
9. Enter the following command to disable DHCP:
   ```
   set management dhcp-status down
   ```
10. Enter the command “save-running” to save the current AP configuration.
11. Enter the command “Exit” to logout the AP.

1.1. Configure the DHCP Server

The Unified Switch can function as a DHCP server to assign addresses to wireless (or wired) clients that connect to each AP. To configure the DHCP Server, you must configure global settings and the address pool for the clients.

For this scenario, wireless clients will be assigned addresses in the range of 10.90.91.1/8 – 10.90.91.254/8. By limiting the range of addresses, you can then configure an ACL to limit the network access of all clients that have addresses within this range and still maintain additional addresses in this space for static configuration for clients or servers.

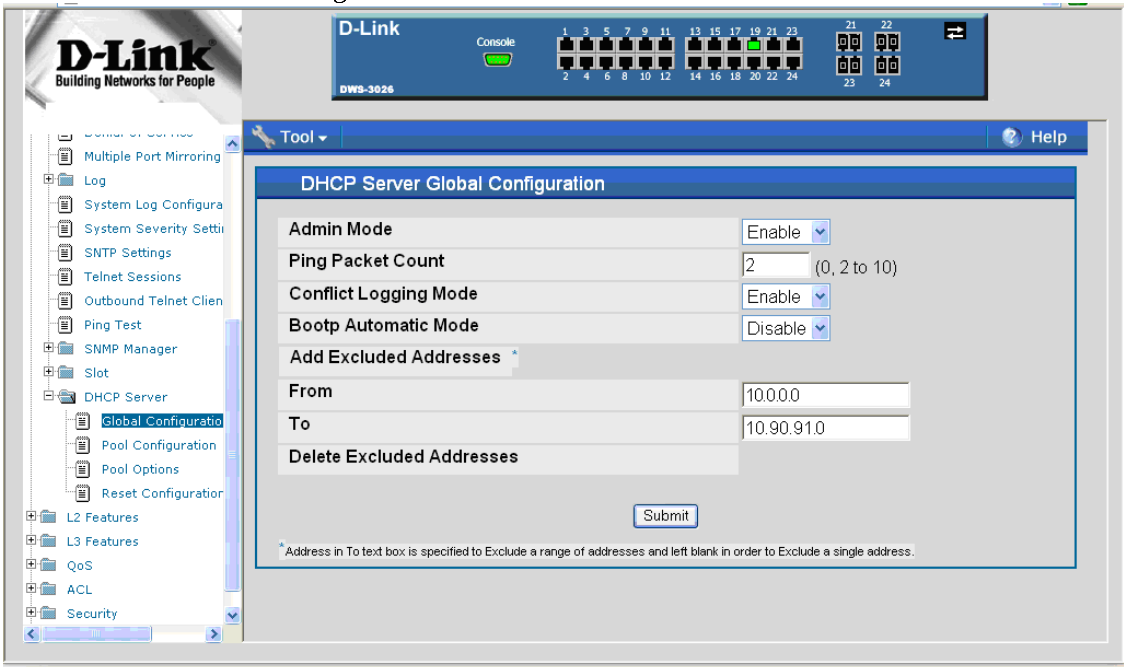
Since these addresses are on the 10.0.0.0 network as well as the AP and switch management addresses, you must exclude all addresses that are not in the desired client range.

GuestPool	Excluded Addresses	Subnet Mask
10.90.91.1 – 10.90.91.254	10.0.0.1 - 10.90.91.0 10.90.92.0 – 10.255.255.255	255.0.0.0

1.1.1. Global DHCP Configuration

Use the following procedures to configure the global DHCP settings.

1. Select the LAN tab from the navigation panel and access **Administration → DHCP Server → Global Configuration**.
2. Enable the **Admin Mode**
3. Add the excluded addresses as following:
    a. 10.0.0.0 through 10.90.91.0
    b. 10.90.92.0 through 10.255.255.255



DHCP Server Global Configuration

Admin Mode	Enable
Ping Packet Count	2 (0, 2 to 10)
Conflict Logging Mode	Enable
Bootp Automatic Mode	Disable
Add Excluded Addresses *	
From	10.0.0.0
To	10.90.91.0
Delete Excluded Addresses	

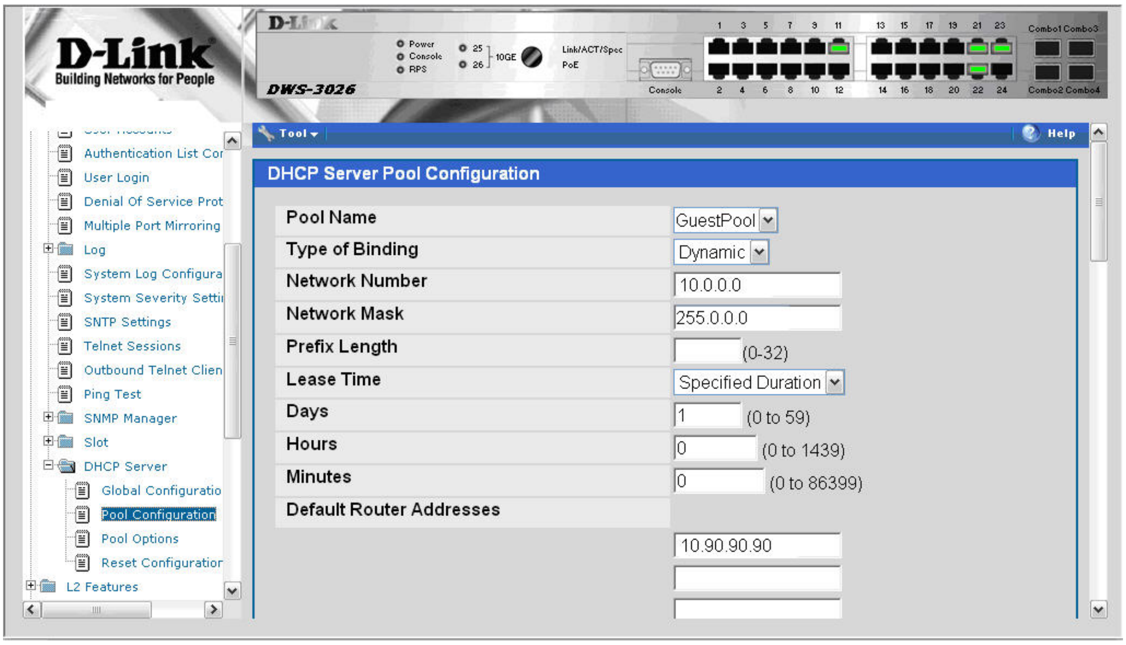
Submit

*Address in To text box is specified to Exclude a range of addresses and left blank in order to Exclude a single address.

1.1.2. Pool Configuration

This section describes how to configure the address pool for the wireless clients.

1. Select **Pool Configuration** in the Navigation tree.
2. Select ***create*** and specify the following settings:
   a. **Pool Name** – GuestPool
   b. **Type of Binding** - Dynamic
   c. **Network Number** – 10.0.0.0
   d. **Network Mask** - 255.0.0.0
   e. **Days** - 1 day
   f. **Hours** - 0
   g. **Minutes** - 0
   h. **Default Router Addresses** – *10.90.90.90*



DHCP Server Pool Configuration

Pool Name	GuestPool
Type of Binding	Dynamic
Network Number	10.0.0.0
Network Mask	255.0.0.0
Prefix Length	(0-32)
Lease Time	Specified Duration
Days	1 (0 to 59)
Hours	0 (0 to 1439)
Minutes	0 (0 to 86399)
Default Router Addresses	10.90.90.90

1.2. ACL Configuration

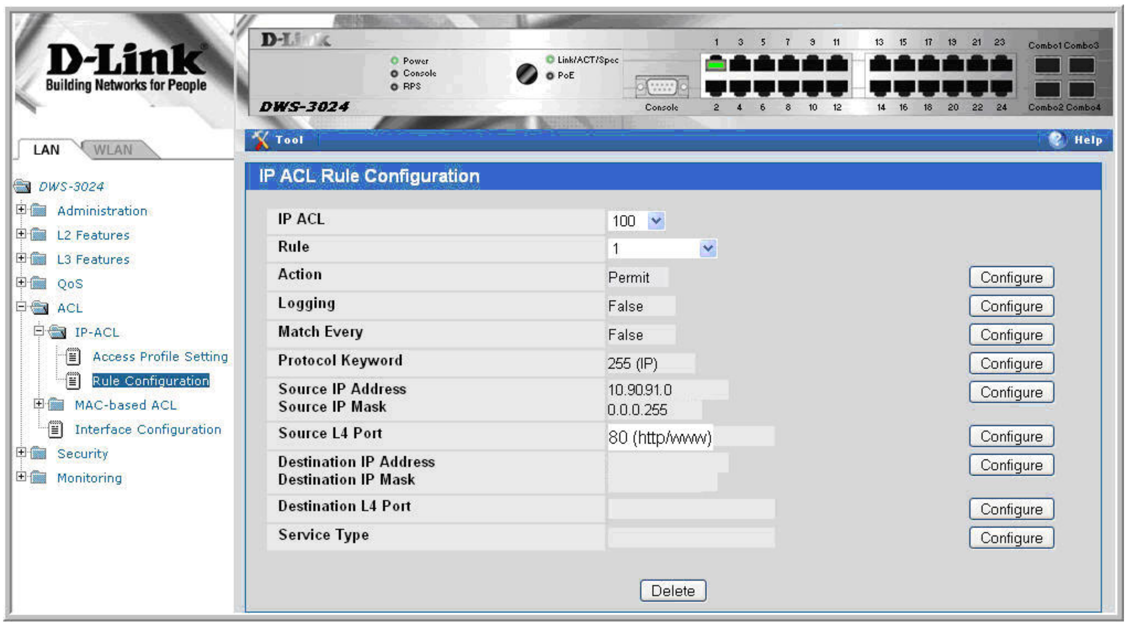
The ACL in this scenario prevents wireless clients from accessing the web management interface of the switch. All other types of traffic is allowed.

1. From the LAN menu, navigate to the **Access Control Lists > IP ACL > Access Profile Settings** page.
2. From the **IP ACL** field, select **Create New Extended ACL** from the drop-down menu.
3. Enter 100 in the **ACL ID** field, then click **Submit**.
4. From the **Rule Configuration** page, enter 1 as the Rule ID, Deny as the **Action**, and False for **Match Every**, then click **Submit**.
5. The screen refreshes with additional fields. Click the **Configure** button associated with the appropriate fields and enter the following criteria to deny HTTP traffic from clients on the Guest Network to the Switch and APs:
   - **Protocol Keyword**: IP
   - **Source IP Address**: 10.90.91.1
   - **Source IP Mask**: 0.0.0.255 (This is a wildcard mask)
   - **Destination IP Address:** 10.90.90.1

- **Destination IP Mask:** 0.0.0.255
- **Destination L4 Port**: http

6. Create a new rule, enter 2 as the Rule ID, Permit as the **Action**, and True for **Match Every**, then click **Submit**. The reason for this second rule is that an ACL has an implicit “deny all” rule at the end. ACL rules are checked in order and the action of the first to match the flow is taken. If no match occurs, the packet will be dropped.

Rule 1



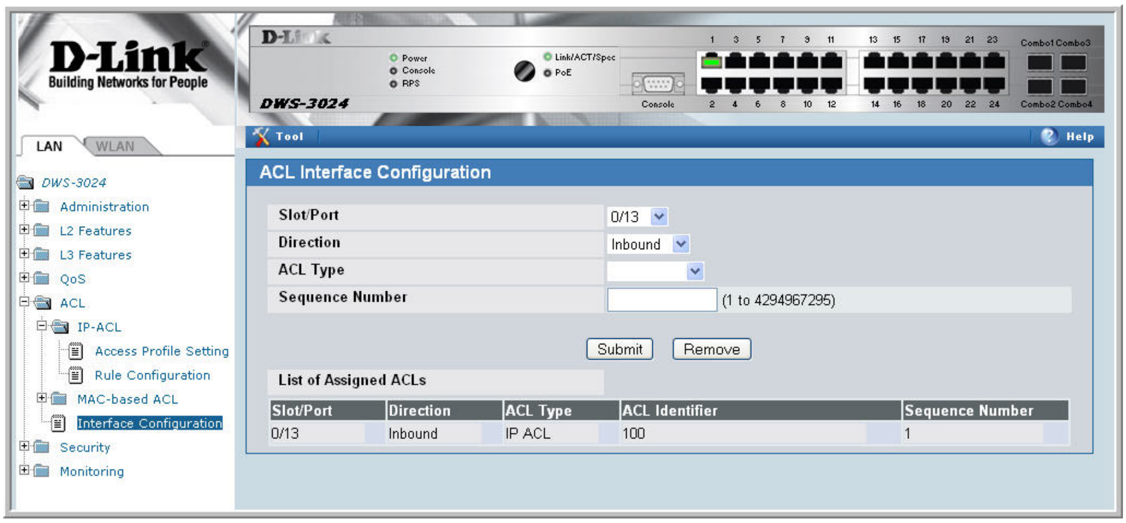
IP ACL Rule Configuration

IP ACL	100	
Rule	1	
Action	Permit	Configure
Logging	False	Configure
Match Every	False	Configure
Protocol Keyword	255 (IP)	Configure
Source IP Address Source IP Mask	10.90.91.0 0.0.0.255	Configure
Source L4 Port	80 (http/www)	Configure
Destination IP Address Destination IP Mask		Configure
Destination L4 Port		Configure
Service Type		Configure

Delete

Next, you must attach the ACL to port 0/1 and port 0/13 (the physical ports to which the APs will be connected) so that the rules are applied to the appropriate wireless client traffic that goes through the APs connected to the switch.

1. From the **ACL → Interface Configuration** page,
2. Select port 0/1 from the **Slot/Port** drop-down menu.
3. Select IP ACL as the **ACL Type**.
4. Enter 1 as the sequence number, and click Submit.
5. Repeat the steps to associate ACL 100 with port 0/13.



ACL Interface Configuration

Slot/Port	0/13
Direction	Inbound
ACL Type	
Sequence Number	(1 to 4294967295)

Submit Remove

List of Assigned ACLs

Slot/Port	Direction	ACL Type	ACL Identifier	Sequence Number
0/13	Inbound	IP ACL	100	1

1.3. Wireless Configuration

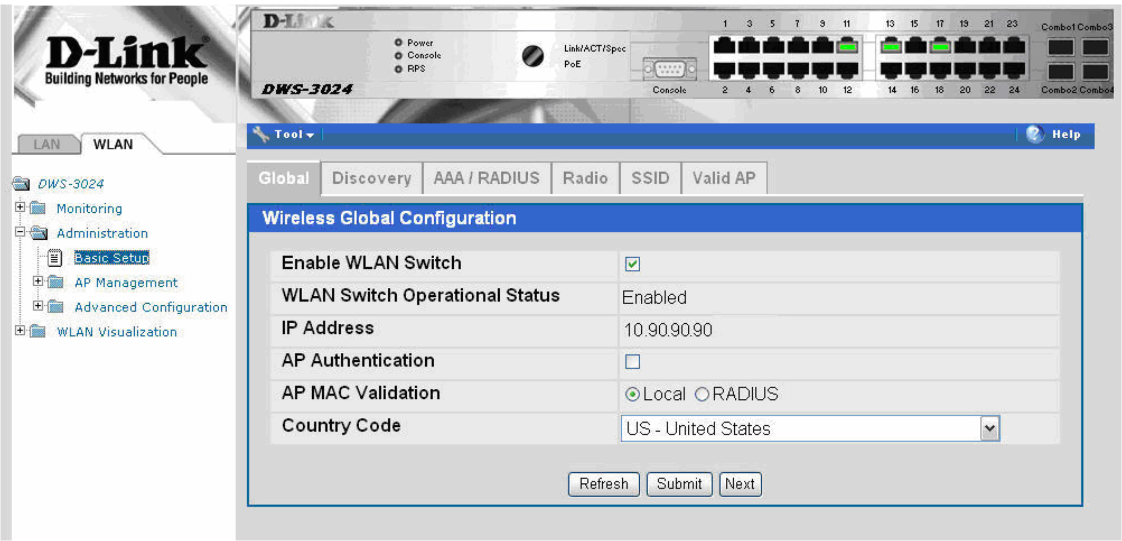
You configure and monitor all wireless settings from the WLAN tab on the navigation panel. Since the deployment is an L2 Edge and there are no subnet boundaries to cross, the switch can use the network management IP address for the wireless functions (**Note:** the Unified Switch component uses an IP address to manage the APs and peer-switches. In a L2 environment like this scenario no inter-subnet routing is required. If however the scenario involves a L3 environment where wireless components including APs and peer-switches cross subnet boundaries, a routing interface must be used, such as a loopback interface to allow routing of control traffic between the Unified Switch and APs and peer switches.)

It is important to set the correct country code on the switch so that the APs operate in the correct regulatory domain.

1. To configure wireless features, select the **WLAN** tab from the left pane and traverse down the navigation tree to **Administration → Basic Setup**.
2. Select the Global tab in the right pane and make sure **WLAN Switch Mode** is enabled
3. Select the appropriate country code then click the **Submit** to submit the request.

Note: This scenario uses the default AP profile configuration, so you do not need to configure any AAA/RADIUS, Radio, or SSID settings.

Note: The IP address on the Wireless Global Configuration page is the default management IP address of the switch (10.90.90.90). This address is “chosen” by the system for use by the Wireless component for communications with the APs and Peer Switches. If a loopback interface is available, this will be selected first.



Wireless Global Configuration

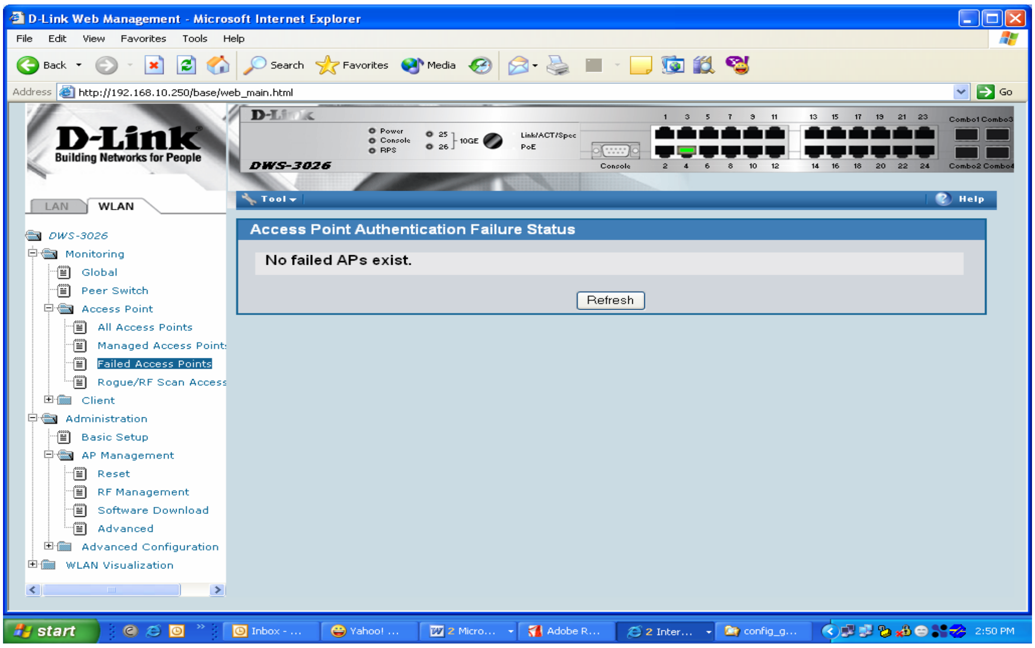
Enable WLAN Switch	☑
WLAN Switch Operational Status	Enabled
IP Address	10.90.90.90
AP Authentication	□
AP MAC Validation	● Local ○ RADIUS
Country Code	US - United States

1.4. *Device Connections*

At this point, all the devices are ready to be connected. After the switch discovers the APs, they will appear on the Failed list because the MAC addresses of the APs are not configured in the Valid AP database (i.e. the switch has not been configured to accept any valid APs).

1. Connect AP1 to **port 1** of the switch
2. Connect AP2 to **port 13** of the switch
3. Wait about 60 seconds and click **Monitoring → Access Points → Authentication Failed Access Points**.
4. Select the APs to be managed and click **Manage** to add them to the valid AP database.
5. To verify the status of APs, click **Monitoring → Access Point → Managed Access Points**.
6. To view the local Valid AP database, click **Administration → Basic Setup**, then click the **Valid AP** tab.

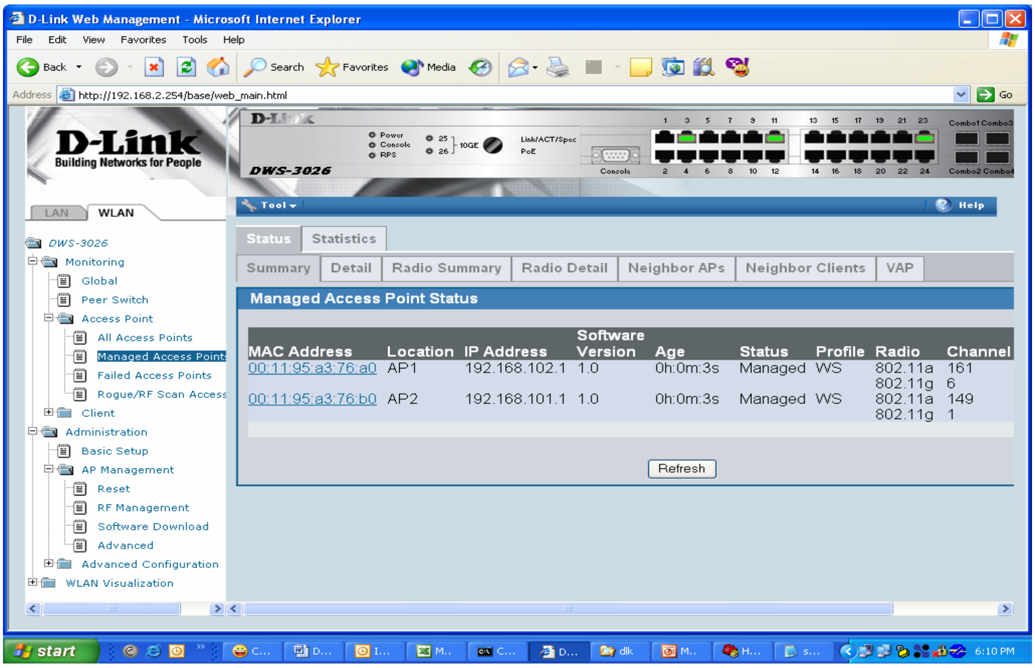
Note: The APs get into Failed Access Point list in about 60 seconds. After you select APs to be managed, the APs enter to fully managed state in about 60 seconds.



Access Point Authentication Failure Status

No failed APs exist.

Refresh



Managed Access Point Status

MAC Address	Location	IP Address	Software Version	Age	Status	Profile	Radio	Channel
00:11:95:a3:76:a0	AP1	192.168.102.1	1.0	0h:0m:3s	Managed	WS	802.11a 802.11g	161 6
00:11:95:a3:76:b0	AP2	192.168.101.1	1.0	0h:0m:3s	Managed	WS	802.11a 802.11g	149 1

Refresh

1.5. Save Configuration

To save the switch configuration, select **Save Changes** from the tool bar.

1.6. Verify the Configuration

1. From a wireless client, verify that you can see the “Guest Network” SSID.
2. Using a wireless client, connect to the “Guest Network”.
3. Check the IP address that the switch DHCP server assigned.
4. Try pinging from a client on the Guest Network to the switch or AP IP address. The ping should pass. Try web browsing to the switch IP address. The browse should fail because of the ACL.

1.7. Feature Tests

This section has some recommend tests you can perform to demonstrate some of the Unified Access System features. Note that the images in this section show IP address and other configuration information that is different than the configuration used in Scenario 1. These images are provide for reference and are not intended to be an exact match of what you see on your switch.

1.7.1. L2 Start Roaming Test

Try roaming between the two APs (you can simulate this by disconnecting an AP from the switch port that you are currently associated with assuming you are utilizing PoE to power the AP). Check the associated client statistics to see which AP the client associates with and to observe that the client has roamed to be associated with the other AP. If you start a Ping between the client and the Unified Switch, you will also observe minimal packet loss during a roam.

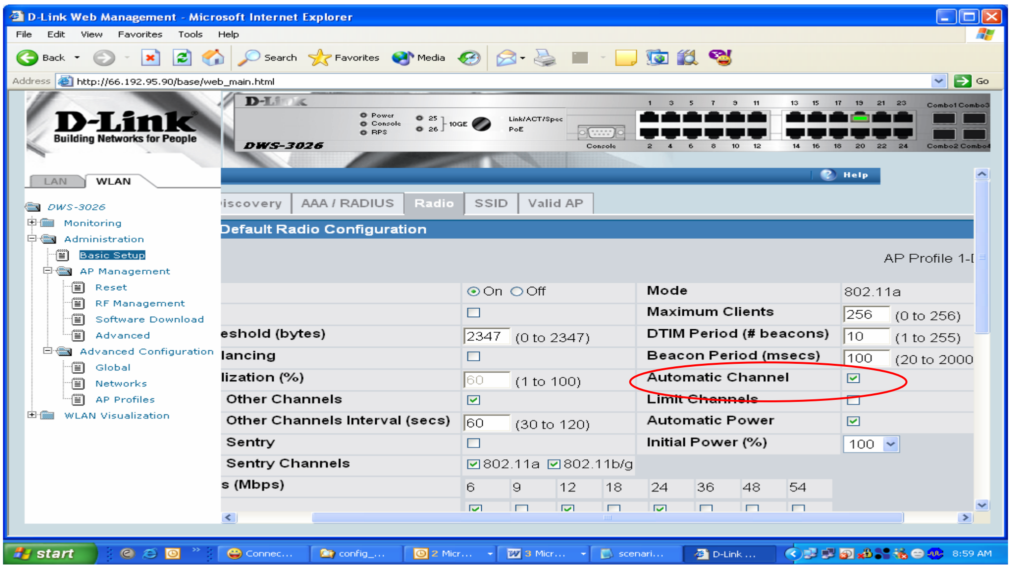
1.7.2. Auto channel adjustment after associating with AP2

To check the current operating channel and to see if any channel adjustment is required, select the WLAN tab from the navigation panel and traverse down to **Monitoring → Access Points → Managed Access Points**.

When an AP is powered up, the Initial Channel Selection (ICS) algorithm is used to select the best operating channel. The algorithm scans all the available channels (based on the country code) by counting the number of packets received on each channel and selects the channel with the lowest packet count.

A second algorithm, Auto Channel Adjustment (ACA) is used to periodically evaluate the operating channel. The radio must be configured for Auto Channel Adjustment. This can be done by selecting the **Automatic Channel** check box in the **Radio tab** of the **Basic Setup** page. By default this parameter is enabled.

Note: Any changes made to the profile configuration must be explicitly applied to the AP. To apply the profile, navigate to **Administration → Advanced Configuration → AP Profiles**, select the profile to apply, and click **Apply**. This will temporarily disable the radios as the new configuration is applied to the access points that use the profile. In other words, you can make and submit one or many changes to an AP profile however these configuration modifications will not be applied to the AP until you manually apply the profile or an AP comes online into managed state after the profile changes are submitted.



Default Radio Configuration

AP Profile 1-[

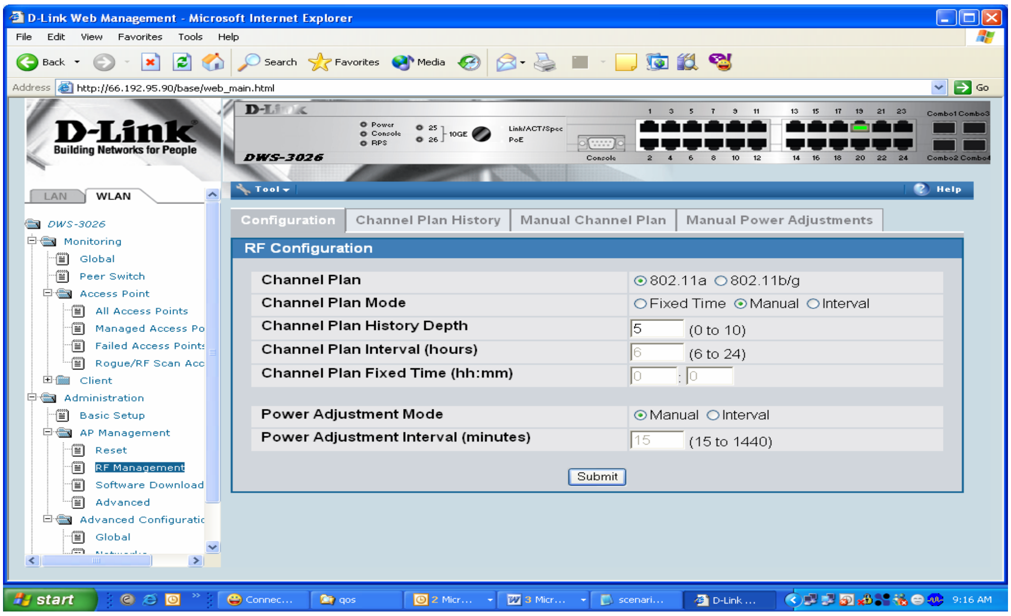
	● On ○ Off	Mode	802.11a
	□	Maximum Clients	256 (0 to 256)
eshold (bytes)	2347 (0 to 2347)	DTIM Period (# beacons)	10 (1 to 255)
lancing	□	Beacon Period (msecs)	100 (20 to 2000
lization (%)	60 (1 to 100)	Automatic Channel	☑
Other Channels	☑	Limit Channels	□
Other Channels Interval (secs)	60 (30 to 120)	Automatic Power	☑
Sentry	□	Initial Power (%)	100
Sentry Channels	☑ 802.11a ☑ 802.11b/g		

s (Mbps)	6	9	12	18	24	36	48	54
	☑	□	☑	□	☑	□	□	□

The Channel adjustment algorithm may be triggered periodically or manually.
To manually adjust the channel plan, use the following steps:

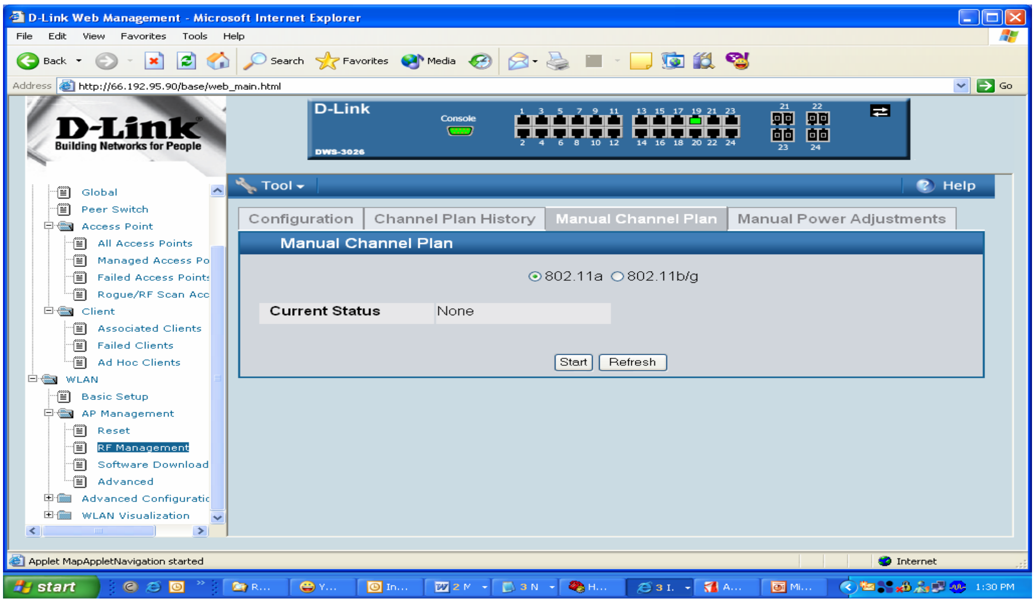
1. Select the WLAN tab from the navigation panel and navigate to **Administration → AP Management → RF Management**.
2. Choose the 802.11 b/g and select the **Manual Channel Plan** tab and then the **Start** button to start the process. Use the **Refresh** button to check the results of the channel plan.
3. Apply the suggested channel plan by clicking on “Apply” button.

Note: Before manually triggering the adjustment, the **Channel Plan History Depth** must be set to 0 or 1. This can be done by changing the **Channel Plan History Depth** in the **Configuration** tab of the **RF Management**. By default this parameter is set to 5.



RF Configuration

Channel Plan	● 802.11a ○ 802.11b/g
Channel Plan Mode	○ Fixed Time ● Manual ○ Interval
Channel Plan History Depth	5 (0 to 10)
Channel Plan Interval (hours)	6 (6 to 24)
Channel Plan Fixed Time (hh:mm)	0 : 0
Power Adjustment Mode	● Manual ○ Interval
Power Adjustment Interval (minutes)	15 (15 to 1440)



Manual Channel Plan

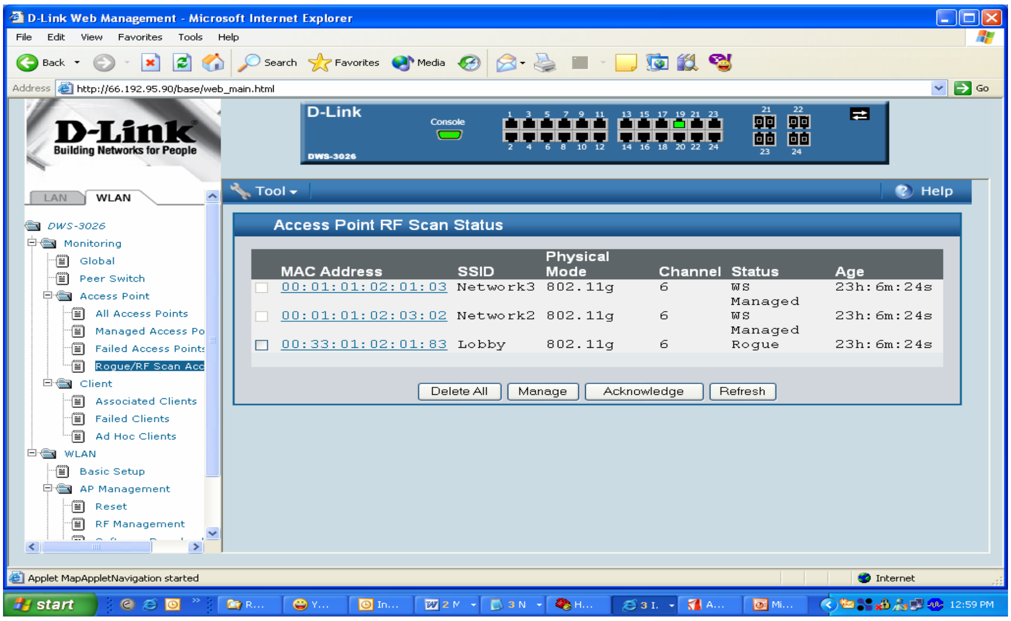
● 802.11a ○ 802.11b/g

Current Status	None

You may also manually change the operational channel from the **Administration → AP Management → Advanced** page. Select the appropriate channel of the AP radio and change it to the desired channel on the next screen.

1.7.3. Rogue AP Detection

To check the rogue AP list, select the WLAN tab from the navigation panel and navigate to **Monitoring → Access Points → Rogue/RF Scan Access Points**.



Access Point RF Scan Status

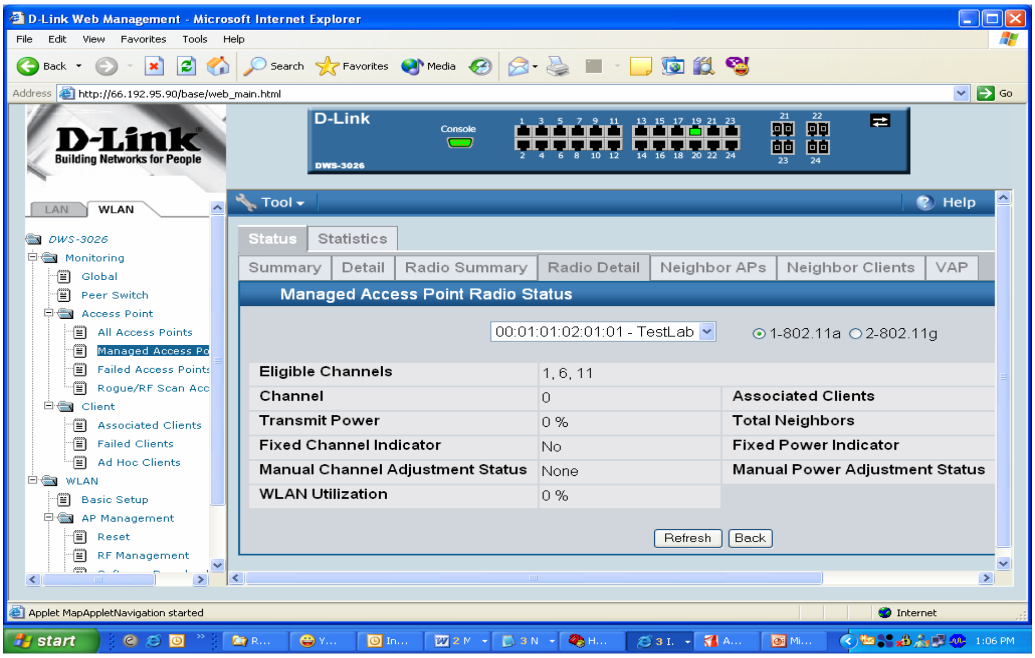
	MAC Address	SSID	Physical Mode	Channel	Status	Age
□	00:01:01:02:01:03	Network3	802.11g	6	WS Managed	23h:6m:24s
□	00:01:01:02:03:02	Network2	802.11g	6	WS Managed	23h:6m:24s
□	00:33:01:02:01:83	Lobby	802.11g	6	Rogue	23h:6m:24s

1.7.4. Power Adjustment

To check power level, select the WLAN tab from the navigation panel and click **Monitoring → Access Points → Managed Access Points**. Select **Radio Details** tab to check the power level.

The Automatic Power Adjustment algorithm works by setting the initial power of the AP to the value specified in the AP profile. The power is then periodically adjusted to a level based on presence or absence of packet transmission errors. The power is changed in increments of 10%. Automatic adjustment can be done by selecting the **Automatic Power** in the **Radio** tab of the **Basic Setup**. By default this parameter is enabled. The algorithm may be triggered by a periodic timer or manually.

Note: The algorithm never reduces the AP power below the initial power setting as specified in the profile and since the default power level in the default profile is 100 percent, the power would never be reduced unless this value is first changed.



Managed Access Point Radio Status

00:01:01:02:01:01 - TestLab ● 1-802.11a ○ 2-802.11g

Eligible Channels	1, 6, 11	
Channel	0	Associated Clients
Transmit Power	0 %	Total Neighbors
Fixed Channel Indicator	No	Fixed Power Indicator
Manual Channel Adjustment Status	None	Manual Power Adjustment Status
WLAN Utilization	0 %	

The power adjustment may be manually triggered by selecting the WLAN tab from the navigation panel and traversing down to **Administration → AP Management → RF Management**. Select the **Manual Power Adjustments** tab and then the **Start** button to start the process (click the **Apply** button to apply new power adjustment)

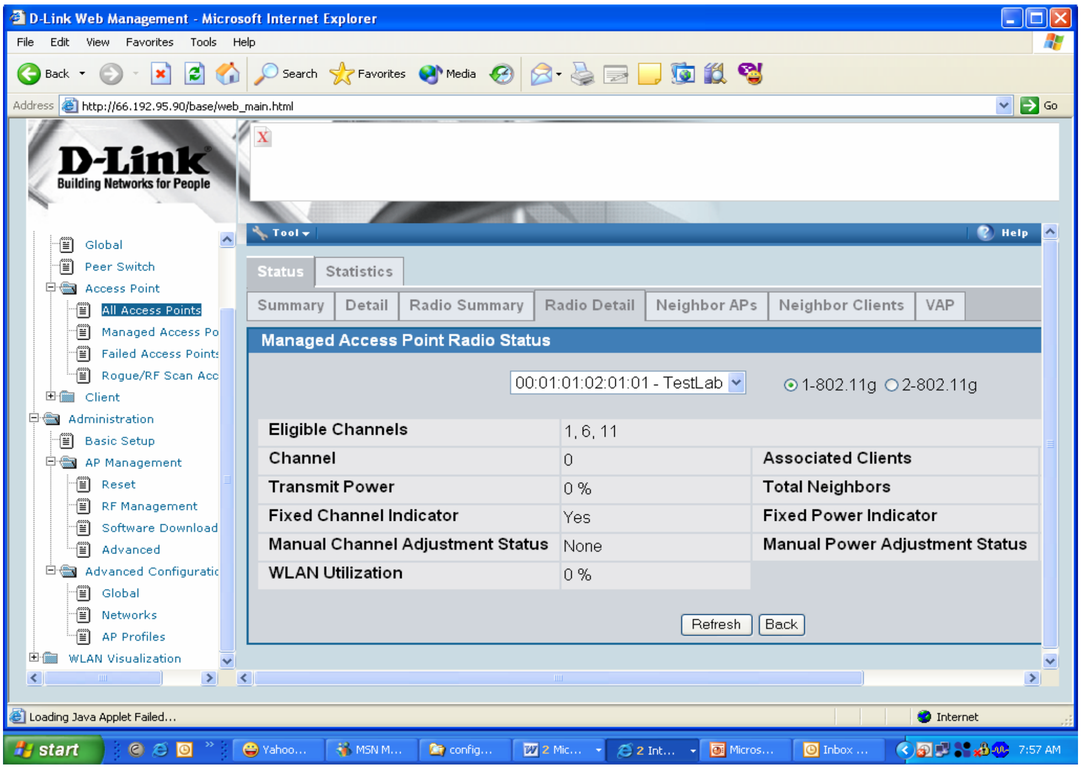
You may change the power of the AP radio by selecting the **Radio tab** of the **Basic Setup** and changing the **Initial Power** to the desired setting and click on ***submit***.

Note: Any changes to the radio setting must be applied to the AP. To do this, click **Administration → Advanced Configuration → AP Profiles**. Select the profile to apply, then click **Apply** to update all APs that use the selected profile.

1.7.4.1. Self Healing Cell Recovery

When a Managed AP is powered down, the power of its neighboring AP(s) managed by the same switch is immediately increased by 20%. **Power Adjustment Mode** should be **Interval** to see an increase in power of neighboring AP. By default, **Initial Power** is 100%, so decrease power of APs below 80% or less to see 20% increase before powering down one AP. The power level can be verified in the **Radio detail** on the **Monitoring →Access Points → Managed Access Points** page.

Note: A maximum of 3 neighboring APs are adjusted.



Managed Access Point Radio Status

00:01:01:02:01:01 - TestLab ● 1-802.11g ○ 2-802.11g

Eligible Channels	1, 6, 11		
Channel	0	Associated Clients	
Transmit Power	0 %	Total Neighbors	
Fixed Channel Indicator	Yes	Fixed Power Indicator	
Manual Channel Adjustment Status	None	Manual Power Adjustment Status	
WLAN Utilization	0 %		

1.7.5. Load Balancing

The Unified Switch performs load balancing on a per radio basis by tracking the wireless bandwidth utilization. The maximum bandwidth utilization is configured in the **Radio** tab of the **Basic Setup**. If the utilization reaches the configured threshold then new client associations are rejected. The default bandwidth utilization threshold is 60%. The **WLAN Utilization** may be monitored in the **Radio Details** tab of **Monitoring → Access Points → Managed Access Points**.

1.8. Switch and AP Cleanup

You will not need any of the settings you configured in this scenario for the other three scenarios, so it is a good idea to reset the switch and the APs to the factory defaults.

To reset the switch configuration, click the **Tools** menu and select **Reset Configuration**.

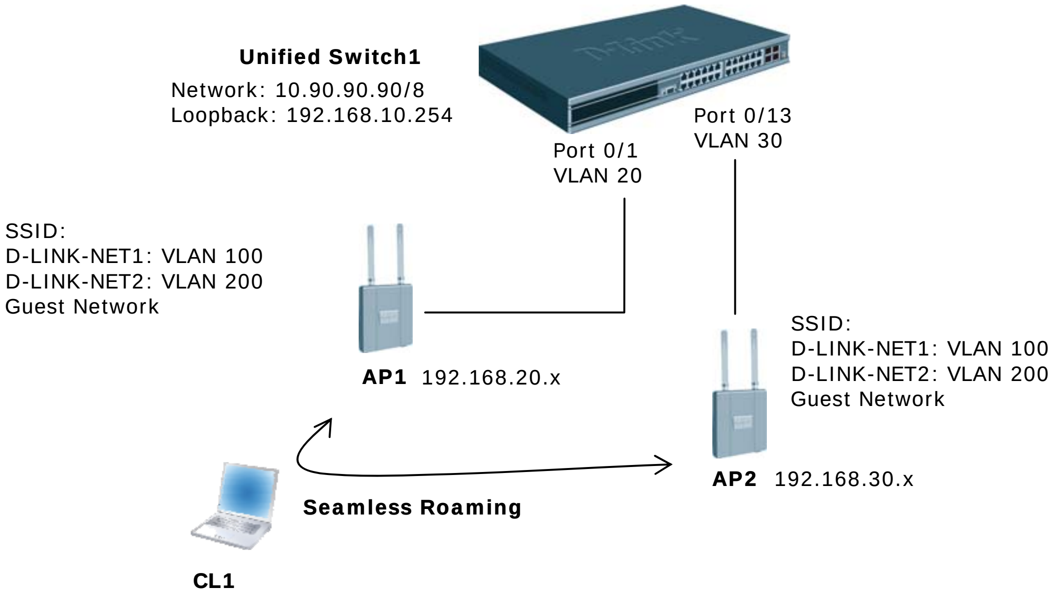
To reset the AP configuration, you will need to telnet into the AP CLI and use the “factory-reset” command. As mentioned earlier, you can place the AP into “debug” mode from the switch if the AP is currently managed to gain access to the UI.

2. Scenario 2 – L2/L3 Edge: 1 Unified Switch + 2 AP

The diagram in this section shows a L2/L3 edge/overlay setup. In this scenario, a Unified Switch acts as an L3 device. Although the two APs are directly connected to the switch, they are in different subnets. Both the APs are managed by the D-LINK Unified Switch. Since the Unified Switch supports VLAN routing, L2 paths can be established between the AP switch ports although they are on different IP subnets such that L3 Tunneling is not required.

This scenario has the following objectives:

- Understand how to implement a real plug & play deployment.
- Configure VLAN routing interfaces to simulate a L3 network with multiple subnets.
- Create an ACL to block IP traffic between clients on different SSIDs.
- Assign IP addresses of APs & wireless clients through the Unified Switch DHCP server.
- Configure multiple SSIDs with different VLANs.
- Enable wireless encryption.



An overview of the configuration steps needed to complete this scenario is as follows:

1. Configure VLANs
2. Configure VLAN routing interfaces
3. Enable routing
4. Create loopback interface for WLAN functions
5. Set up DHCP server and address pools for VLANs
6. Configure ACL
7. Configure the AP profile, including new SSIDs and security
8. Add VLANs to L2 discovery list
9. Attach, discover, and validate APs
10. Save configuration

To begin the Unified Switch configuration, connect to port 12 from a PC on the 10.0.0.0 network and launch the web browser using the default IP address: 10.90.90.90/8. You connect the APs **after** you complete the entire switch configuration.

The IP address information for this scenario is as follows:

Device	**IP Address**
Unified Switch Management Interface	10.90.90.0/8
Unified Switch Loopback Interface	192.168.10.254/32
AP1	192.168.20.x/24
AP2	192.168.30.x/24
Wireless Clients on D-LINK-NET1	192.168.100.x/24
Wireless Clients on D-LINK-NET2	192.168.200.x/24

2.1 Configuring LAN Settings

All of the features you configure in this section are within the **LAN** tab on the D-LINK Unified Switch.

In this scenario, the switch is a L3 device with a total of four VLAN routing interfaces. Each connected AP is in a different subnet, so you need to configure two separate VLAN routing interfaces and configure an IP address for each interface. Each AP has three different VAPs enabled, and each VAP uses a different SSID and VLAN. You create an ACL to block IP traffic between clients on VAP1 and clients on VAP2, so you also need to configure VLAN routing interfaces for the two VAPs. The third VAP is the Guest Network, which is not used in this scenario.

When wireless clients connect to the AP, all traffic from the client is tagged with the VLAN ID associated with the SSID that the client uses to connect. You must configure the VLAN information on the switch so that client traffic is accepted on the ports. (Note: if the VLAN ID of the SSID Network is equal to the untagged-VLAN configured on the AP, which by default is 1, traffic on that Network will be untagged when injected into the network. A Radius server could also be used to assign per-client VLAN assignments.)

1.1.1. Create VLANs

AP1 is connected to port 0/1, and AP2 is connected to port 0/13. The summary information for the VLAN configuration is as follows:

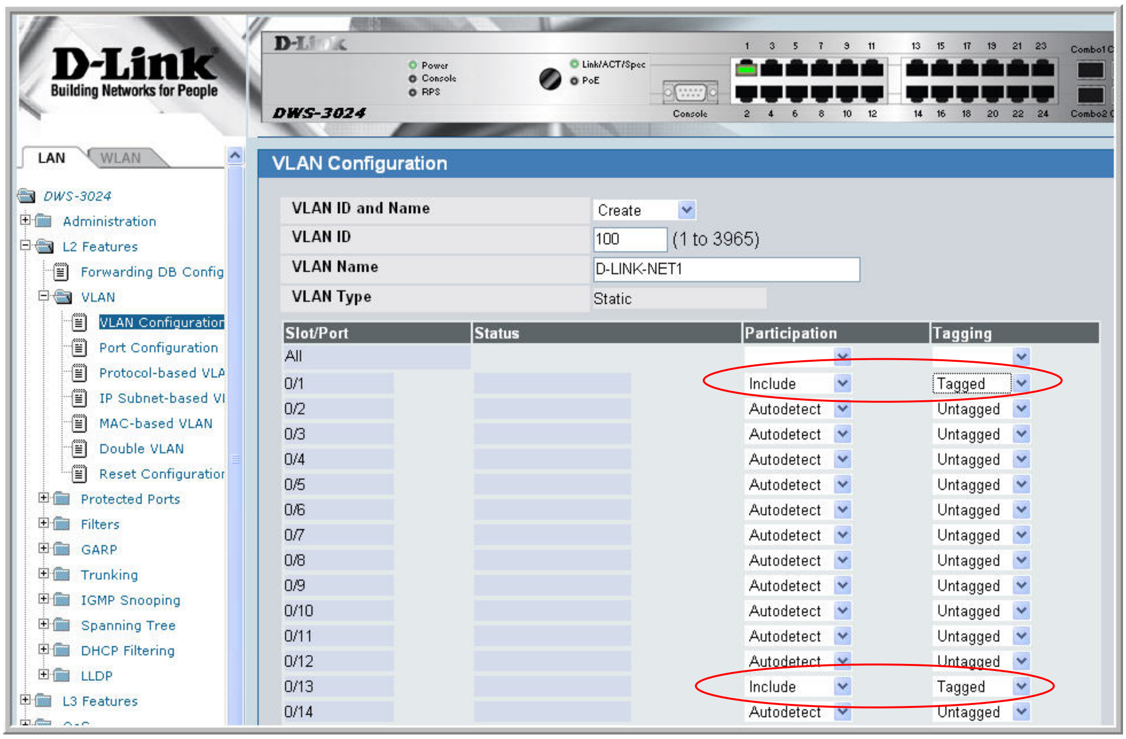
VLAN ID	**VLAN Name**	**Include Ports**	**IP Address**
VLAN 20 (Interface 4/1)	AP1	Port 0/1 **(Untag)**	192.168.20.254
VLAN 30 (Interface 4/2)	AP2	Port 0/13 **(Untag)**	192.168.30.254
VLAN 100 (Interface 4/3)	D-LINK-NET1	Ports 0/1 and 0/13 **(Tagged)**	192.168.100.254
VLAN 200 (Interface 4/4)	D-LINK-NET2	Ports 0/1 and 0/13 **(Tagged)**	192.168.200.254

Also, the default VLAN (PVID) for port 0/1 is 20, and the default VLAN for port 0/13 is 30.

Use the following steps to create and configure each VLAN. Repeat the steps to configure all four VLANs. Refer to the table for information about what value to configure for each VLAN.

1. From the LAN tab on the switch Web interface, click **L2 Features → VLAN → VLAN Configuration**.
2. Select **Create** from **VLAN ID and Name** pull down menu.

3. Enter the **VLAN ID.**
4. Enter **VLAN Name.**
5. On the Slot/Port row for the port to include in the VLAN, select **Include** from the **Participation** drop-down menu.
6. For VLAN 100 and VLAN 200, select **Tagging** from the drop-down menu for port 0/1 and 0/13. This configuration tells the switch to add an 802.1Q VLAN Tag to the packets that egress the port on those VLANs. This is so that the AP knows which Network (or SSID) to forward the traffic on.
7. Click **Submit.**
8. Repeat for each of the VLANs in the above table.



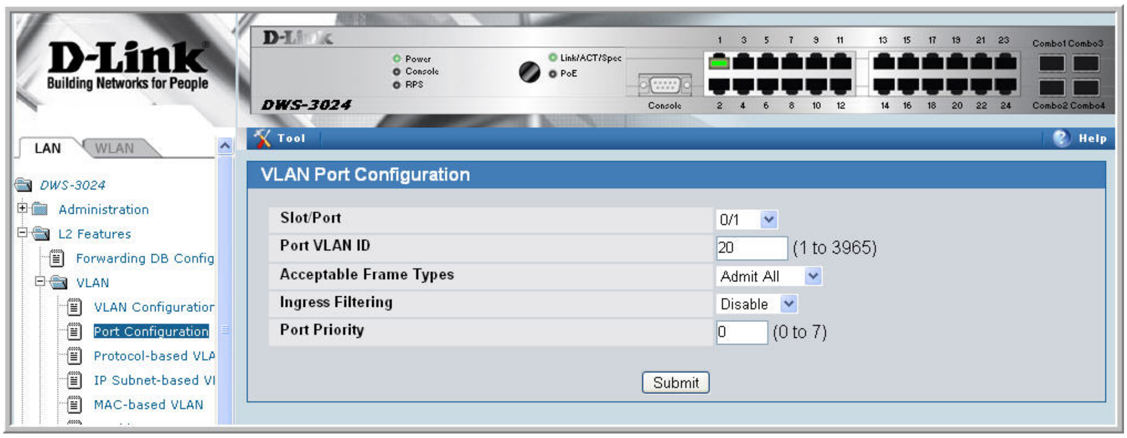
VLAN Configuration

VLAN ID and Name	Create
VLAN ID	100 (1 to 3965)
VLAN Name	D-LINK-NET1
VLAN Type	Static

Slot/Port	Status	Participation	Tagging
All			
0/1		Include	Tagged
0/2		Autodetect	Untagged
0/3		Autodetect	Untagged
0/4		Autodetect	Untagged
0/5		Autodetect	Untagged
0/6		Autodetect	Untagged
0/7		Autodetect	Untagged
0/8		Autodetect	Untagged
0/9		Autodetect	Untagged
0/10		Autodetect	Untagged
0/11		Autodetect	Untagged
0/12		Autodetect	Untagged
0/13		Include	Tagged
0/14		Autodetect	Untagged

Configure the Port VLAN ID for ports 0/1 and 0/13.

1. From the LAN tab on the switch Web interface, click **L2 Features → VLAN → Port Configuration**.
2. Select port 0/1 from the Slot/Port drop-down menu.
3. Enter 20 in the **Port VLAN ID** field.
4. Click **Submit**.
5. Select port 0/13 from the Slot/Port drop-down menu.
6. Enter 30 in the **Port VLAN ID** field.
7. Click **Submit**.



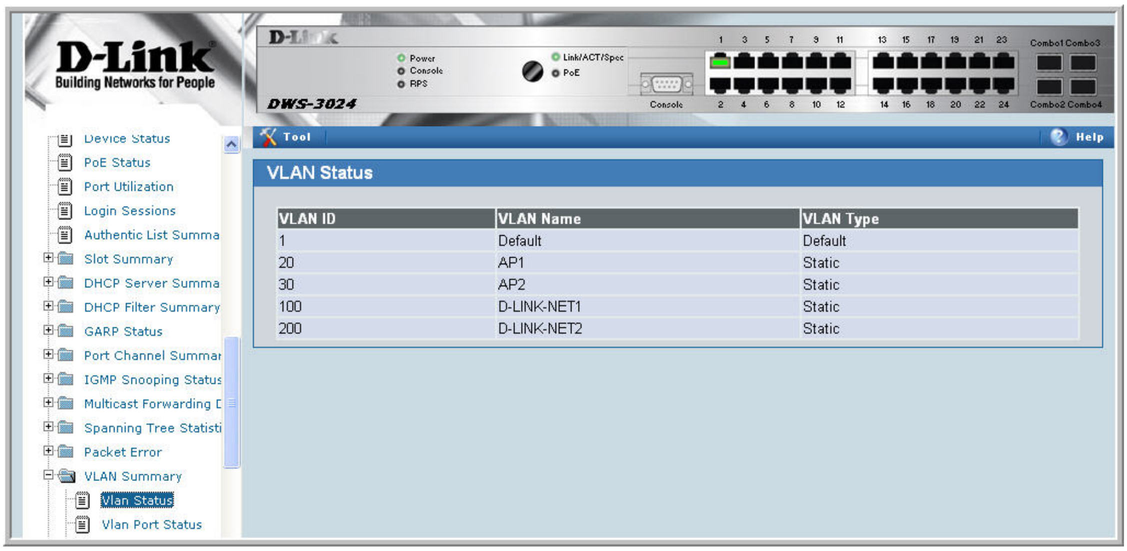
VLAN Port Configuration

Slot/Port	0/1
Port VLAN ID	20 (1 to 3965)
Acceptable Frame Types	Admit All
Ingress Filtering	Disable
Port Priority	0 (0 to 7)

Submit

After you have repeated the steps to configure all four VLANs, use the **Monitoring → VLAN Summary→ VLAN Status** and **VLAN Port Status** pages to verify that the VLANs and the ports are configured properly.

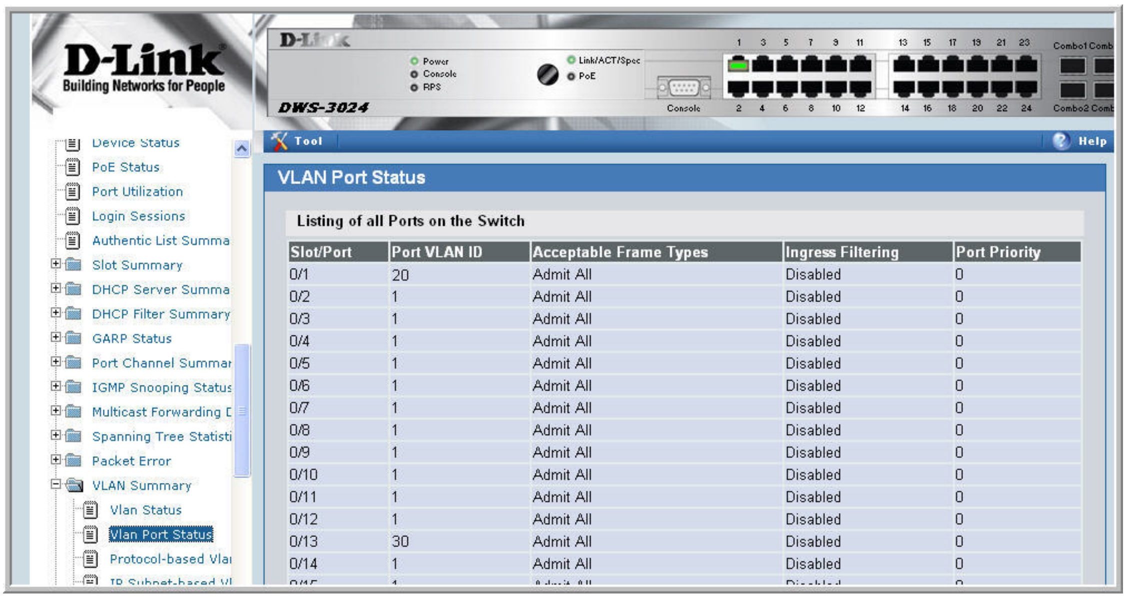
VLAN Status



VLAN Status

VLAN ID	VLAN Name	VLAN Type
1	Default	Default
20	AP1	Static
30	AP2	Static
100	D-LINK-NET1	Static
200	D-LINK-NET2	Static

VLAN Port Status



VLAN Port Status

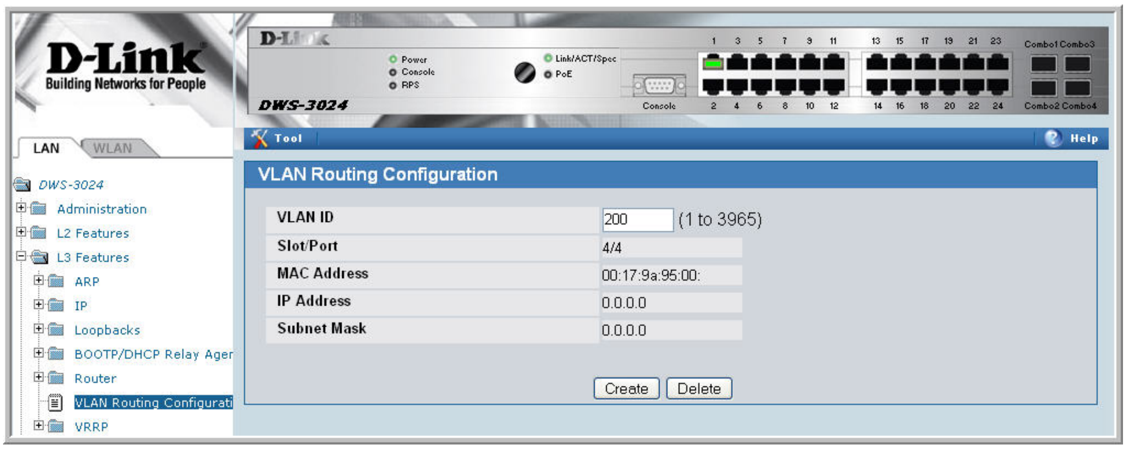
Listing of all Ports on the Switch

Slot/Port	Port VLAN ID	Acceptable Frame Types	Ingress Filtering	Port Priority
0/1	20	Admit All	Disabled	0
0/2	1	Admit All	Disabled	0
0/3	1	Admit All	Disabled	0
0/4	1	Admit All	Disabled	0
0/5	1	Admit All	Disabled	0
0/6	1	Admit All	Disabled	0
0/7	1	Admit All	Disabled	0
0/8	1	Admit All	Disabled	0
0/9	1	Admit All	Disabled	0
0/10	1	Admit All	Disabled	0
0/11	1	Admit All	Disabled	0
0/12	1	Admit All	Disabled	0
0/13	30	Admit All	Disabled	0
0/14	1	Admit All	Disabled	0
0/15	1	Admit All	Disabled	0

1.1.2. Configure VLAN Routing

To configure the VLAN routing interfaces for AP1, AP2, and the two D-LINK-NET networks, use the following steps.

1. Select the LAN tab from the navigation panel and click **L3 Features → VLAN Routing Configuration**.
2. Enter the VLAN ID for VLAN 20 in the VLAN ID field and select **Create** to create a VLAN routing interface for VLAN 20.
   This creates a logical routing interface with the slot/port designation of 4/1 for VLAN 20.
3. Repeat the previous step to create the VLAN routing interfaces for VLAN 30, 100, and 200 (shown below).



VLAN Routing Configuration

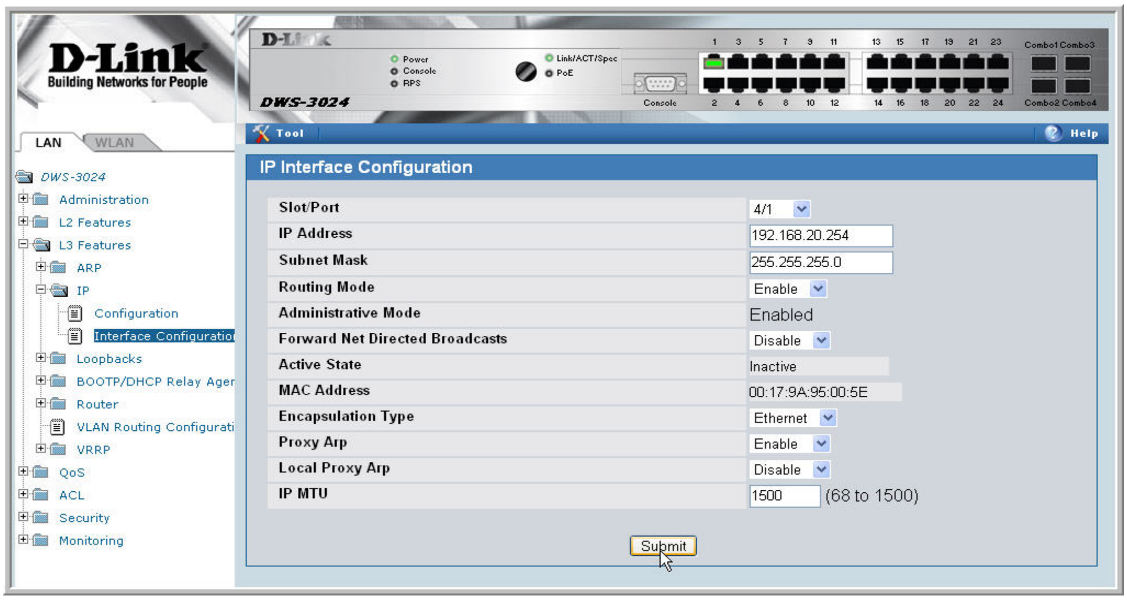
VLAN ID	200 (1 to 3965)
Slot/Port	4/4
MAC Address	00:17:9a:95:00:
IP Address	0.0.0.0
Subnet Mask	0.0.0.0

4. Navigate to **L3 Features → IP → Interface Configuration**.

5. Select interface 4/1 from the Slot/Port drop-down menu and enter the following information:

a. IP Address: 192.168.20.254
b. Subnet Mask: 255.255.255.0
c. Routing Mode: Enable

6. Click **Submit**.



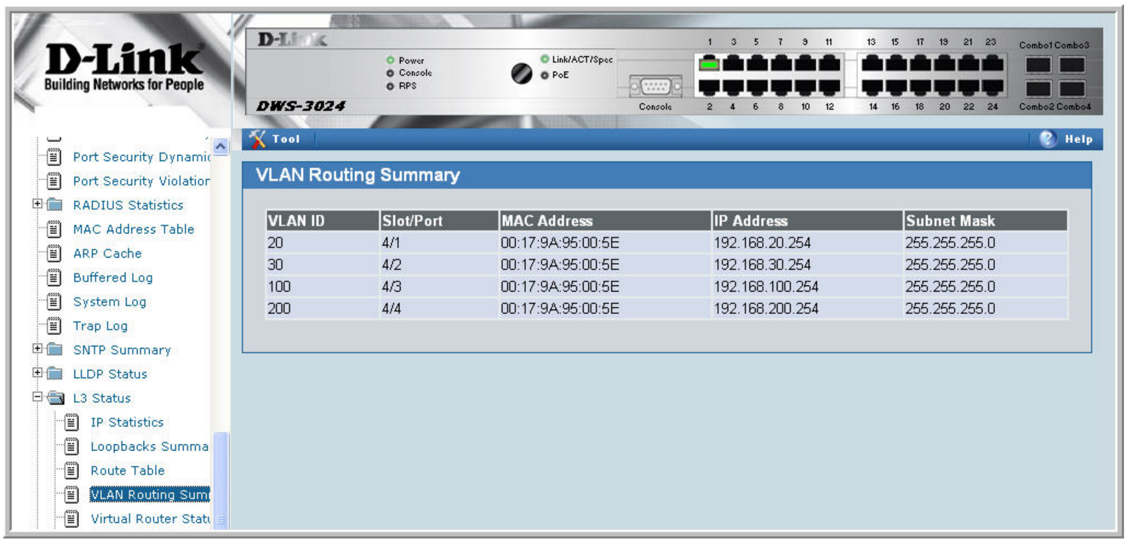
IP Interface Configuration

Slot/Port	4/1
IP Address	192.168.20.254
Subnet Mask	255.255.255.0
Routing Mode	Enable
Administrative Mode	Enabled
Forward Net Directed Broadcasts	Disable
Active State	Inactive
MAC Address	00:17:9A:95:00:5E
Encapsulation Type	Ethernet
Proxy Arp	Enable
Local Proxy Arp	Disable
IP MTU	1500 (68 to 1500)

7. Repeat the steps for interface 4/2 (VLAN 30), 4/3 (VLAN 100), and 4/4 (VLAN 200). Refer to the following table for IP address information:

Interface	IP Address	Subnet Mask
Interface 4/1	192.168.20.254	255.255.255.0
Interface 4/2	192.168.30.254	255.255.255.0
Interface 4/3	192.168.100.254	255.255.255.0
Interface 4/4	192.168.200.254	255.255.255.0

8. Verify the VLAN Routing information on the **Monitoring → L3 Status → VLAN Routing Summary** page.

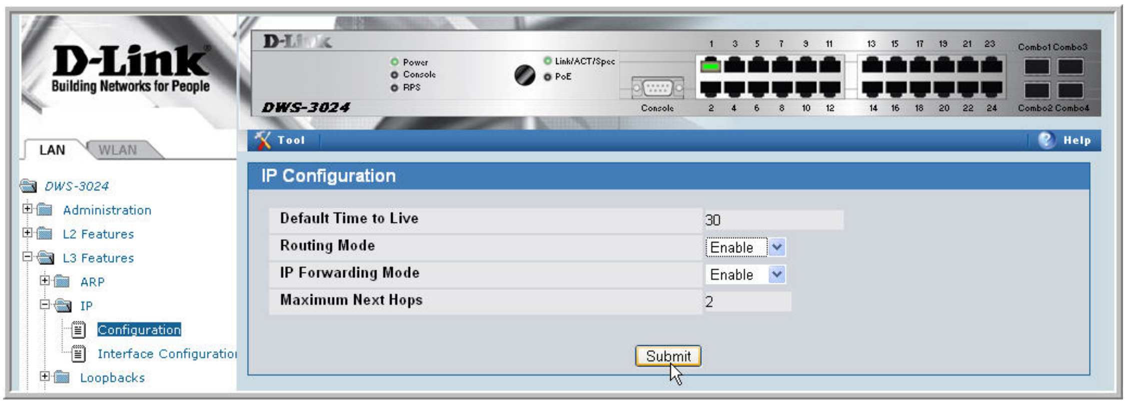


VLAN Routing Summary

VLAN ID	Slot/Port	MAC Address	IP Address	Subnet Mask
20	4/1	00:17:9A:95:00:5E	192.168.20.254	255.255.255.0
30	4/2	00:17:9A:95:00:5E	192.168.30.254	255.255.255.0
100	4/3	00:17:9A:95:00:5E	192.168.100.254	255.255.255.0
200	4/4	00:17:9A:95:00:5E	192.168.200.254	255.255.255.0

1.1.3. Enable Global Routing

You need to enable the routing mode to allow the switch to operate as a L3 device in this scenario. To do this, navigate to the **L3 Features → IP → Configuration** page. Select **Enable** from the Routing Mode drop-down menu and click **Submit**.



IP Configuration

Default Time to Live	30
Routing Mode	Enable
IP Forwarding Mode	Enable
Maximum Next Hops	2

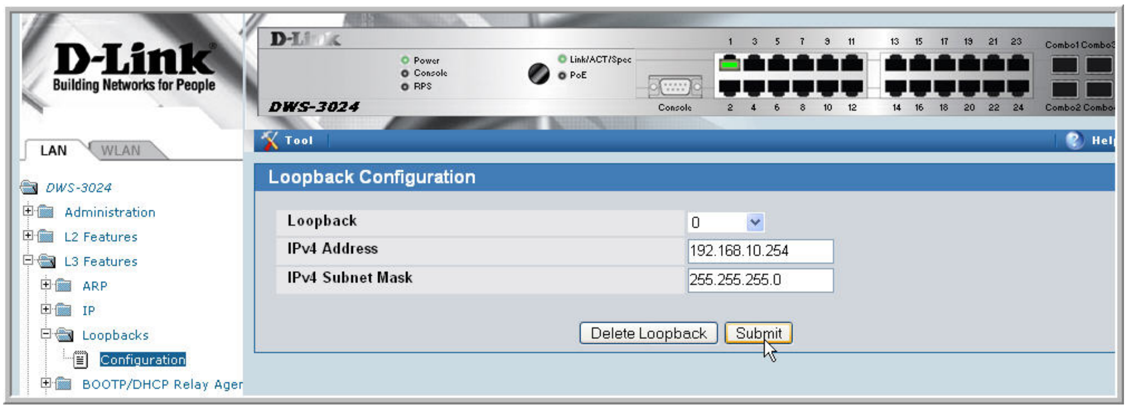
1.1.4. Configure Static Routing

Since all routes are local to the switch, you do not need to configure any static routes for this scenario.

1.1.5. Configure the Loopback Interface

When routing is enabled, you should create a Loopback interface for the wireless functions. The loopback interface isolates the wireless functions from other switching and routing functions that the switch might use. A key benefit to the loopback interface is that it stays up independent of the physical port status. The loopback interface is created on its own subnet and static routes must be configured to allow the rest of the network to get to it.

1. Click **L3 Features -> Loopbacks -> Configuration**
2. If they are not already selected, select Create from the **Loopback** field and 0 in the **Loopback Interface** field.
3. Click **Submit.**
4. After the screen refreshes, enter the following information for the new interface:
   a. **Loopback Interface**: 0
   b. **IP Address**: 192.168.10.254
   c. **Mask**: 255.255.255.0
5. Click **Submit.**



Loopback Configuration

Loopback	0
IPv4 Address	192.168.10.254
IPv4 Subnet Mask	255.255.255.0

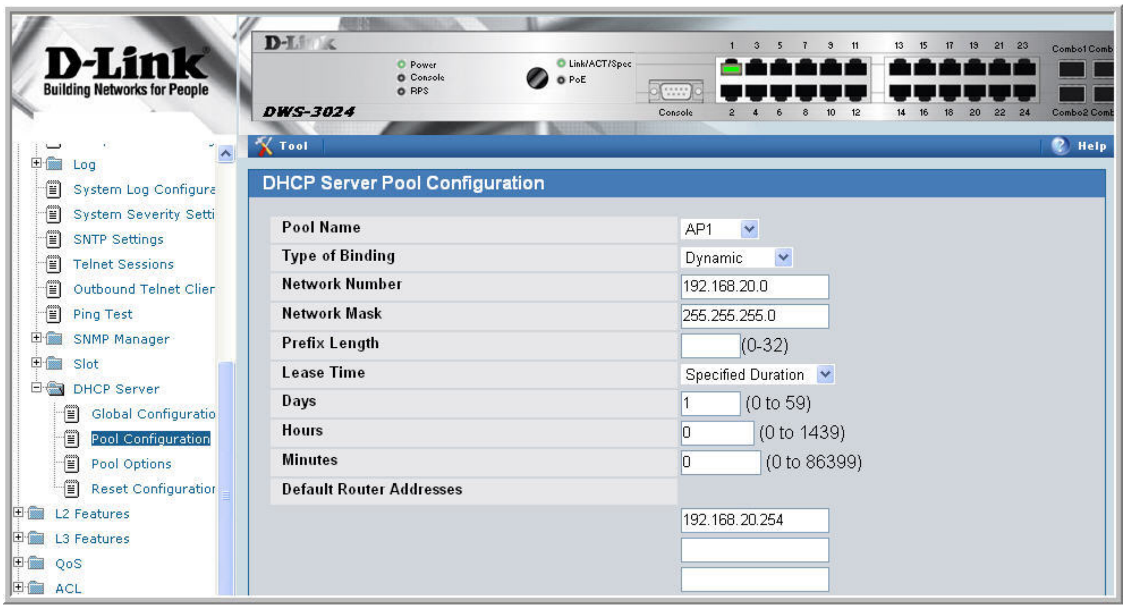
1.1.6. DHCP Server

You need to configure IP address pools for each AP and for the clients that connect to the APs through the D-LINK NET1 and DLINK-NET2 SSIDs.

1. From the LAN menu, click Administration → DHCP Server → Global Configuration
2. In the **Admin Mode** field, select Enable, then click **Submit** to enable the DHCP server..
3. Select **Pool Configuration** in the Navigation tree.
4. For each of the four pools to create, select **create** and specify the following settings:

Pool Name	AP1	AP2	VLAN 100	VLAN 200
Type of Binding	Dynamic	Dynamic	Dynamic	Dynamic
Network Number	192.168.20.0	192.168.30.0	192.168.100.0	192.168.200.0
Network Mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
Days	1 day	1 day	1 day	1 day
Hours	0	0	0	0
Minutes	0	0	0	0
Default Router Address	192.168.20.254	192.168.30.254	192.168.100.254	192.168.200.254

5. Click **Submit** to create the address pool.



DHCP Server Pool Configuration

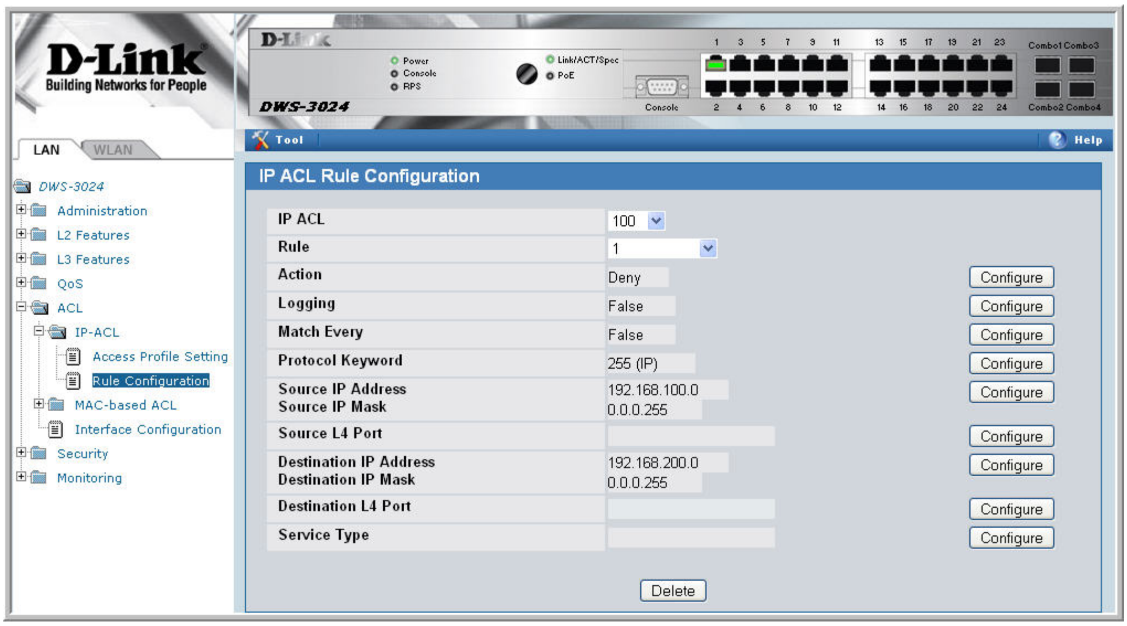
Pool Name	AP1
Type of Binding	Dynamic
Network Number	192.168.20.0
Network Mask	255.255.255.0
Prefix Length	(0-32)
Lease Time	Specified Duration
Days	1 (0 to 59)
Hours	0 (0 to 1439)
Minutes	0 (0 to 86399)
Default Router Addresses	
	192.168.20.254

1.1.7. ACL Configuration

The ACL in this scenario blocks IP traffic between wireless clients who access the network through D-LINK-NET1 and D-LINK-NET2.

1. From the LAN menu, navigate to the **Access Control Lists > IP ACL > Access Profile Settings** page.
2. From the **IP ACL** field, select **Create New Extended ACL** from the drop-down menu.
3. Enter 100 in the **ACL ID** field, then click **Submit**.
4. From the **Rule Configuration** page, enter 1 as the Rule ID, Deny as the **Action**, and click **Submit**.
5. The screen refreshes with additional fields. Click the **Configure** button associated with the appropriate fields and enter the following criteria to deny IP traffic from clients on the D-LINK-NET1 network to clients on the D-LINK-NET2 network:
   - **Protocol Keyword**: IP
   - **Source IP Address**: 192.168.100.0
   - **Source IP Mask**: 0.0.0.255 (This is a wildcard mask)
   - **Destination IP Address**: 192.168.200.0
   - **Destination IP Mask**: 0.0.0.255 (This is a wildcard mask)

Rule 1

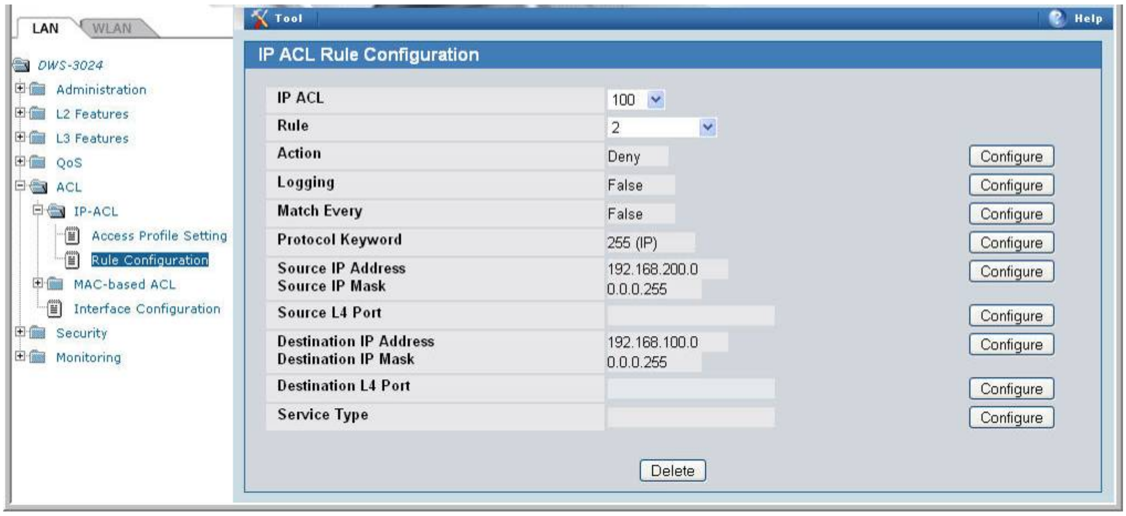


IP ACL Rule Configuration

IP ACL	100
Rule	1
Action	Deny
Logging	False
Match Every	False
Protocol Keyword	255 (IP)
Source IP Address Source IP Mask	192.168.100.0 0.0.0.255
Source L4 Port	
Destination IP Address Destination IP Mask	192.168.200.0 0.0.0.255
Destination L4 Port	
Service Type	

6. From the **Rule** drop-down menu, select Create, and enter 2 into the **Rule ID** field, then click **Submit.**
7. The screen refreshes with additional fields. Click the **Configure** button associated with the appropriate fields and enter the following criteria to deny IP traffic from clients on the D-LINK-NET2 network to clients on the D-LINK-NET1 network:
    - **Protocol Keyword**: IP
    - **Source IP Address**: 192.168.200.0
    - **Source IP Mask**: 0.0.0.255 (This is a wildcard mask)
    - **Destination IP Address**: 192.168.100.0
    - **Destination IP Mask**: 0.0.0.255 (This is a wildcard mask)

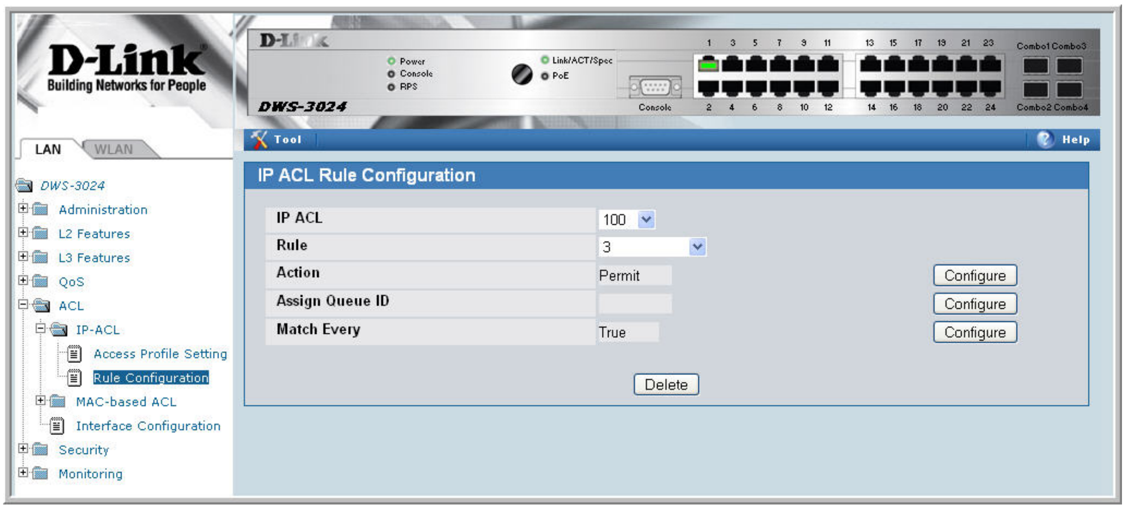
Rule 2



IP ACL Rule Configuration

IP ACL	100
Rule	2
Action	Deny
Logging	False
Match Every	False
Protocol Keyword	255 (IP)
Source IP Address Source IP Mask	192.168.200.0 0.0.0.255
Source L4 Port	
Destination IP Address Destination IP Mask	192.168.100.0 0.0.0.255
Destination L4 Port	
Service Type	

8. Create Rule 3 to allow all other type of traffic between any source and any destination since as mentioned earlier, there is an implicit “deny all” rule at the end of every ACL.
9. From the **Rule** drop-down menu, select Create.
10. Enter 3 into the **Rule ID** field, Permit into the **Action** field, and True in the **Match Every** field, and then click **Submit.**

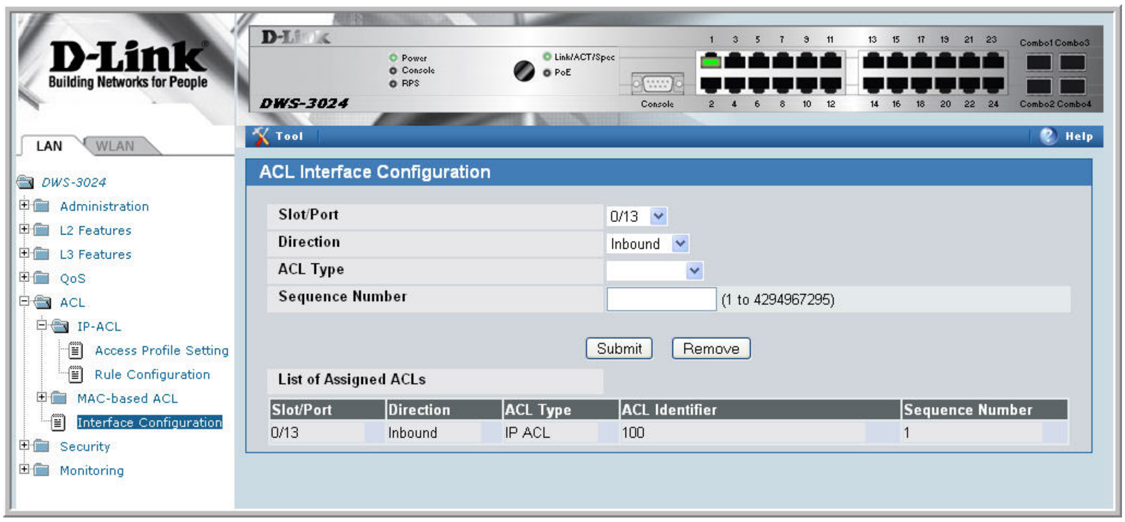


IP ACL Rule Configuration

IP ACL	100
Rule	3
Action	Permit
Assign Queue ID	
Match Every	True

Next, you must attach the ACL to port 0/1 and port 0/13 so that the rules are applied to the appropriate wireless client traffic that goes through the APs connected to the switch.

1. From the **ACL → Interface Configuration** page,
2. Select port 0/1 from the **Slot/Port** drop-down menu.
3. Select IP ACL as the **ACL Type**.
4. Enter 1 as the sequence number, and click Submit.
5. Repeat the steps to associate ACL 100 with port 0/13.



ACL Interface Configuration

Slot/Port	0/13
Direction	Inbound
ACL Type	
Sequence Number	(1 to 4294967295)

List of Assigned ACLs

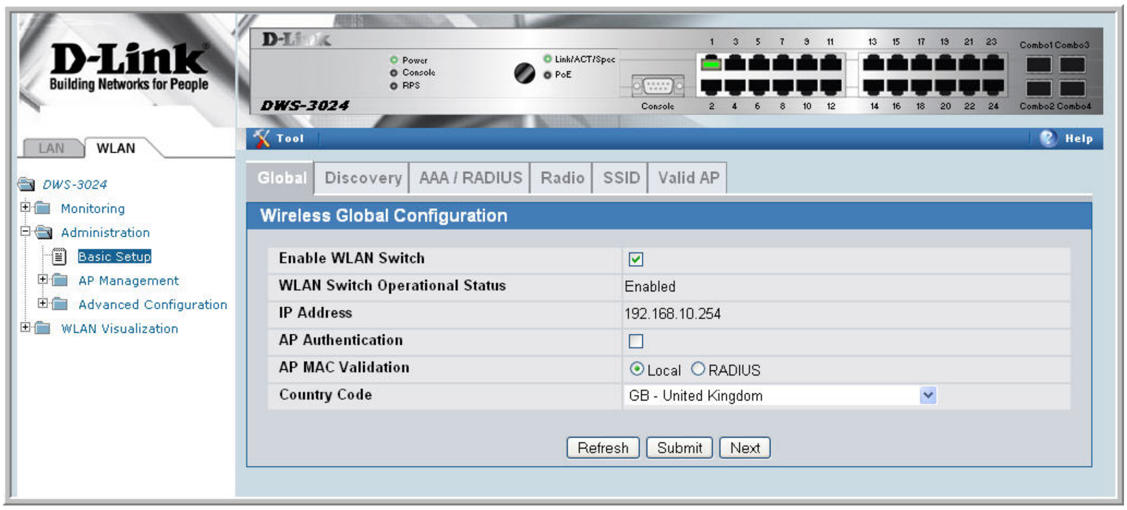
Slot/Port	Direction	ACL Type	ACL Identifier	Sequence Number
0/13	Inbound	IP ACL	100	1

1.2. *Configuring WLAN Settings*

All of the features you configure in this section are within the **WLAN** tab on the D-LINK Unified Switch.

Use the following steps to configure the Unified Switch and the APs.

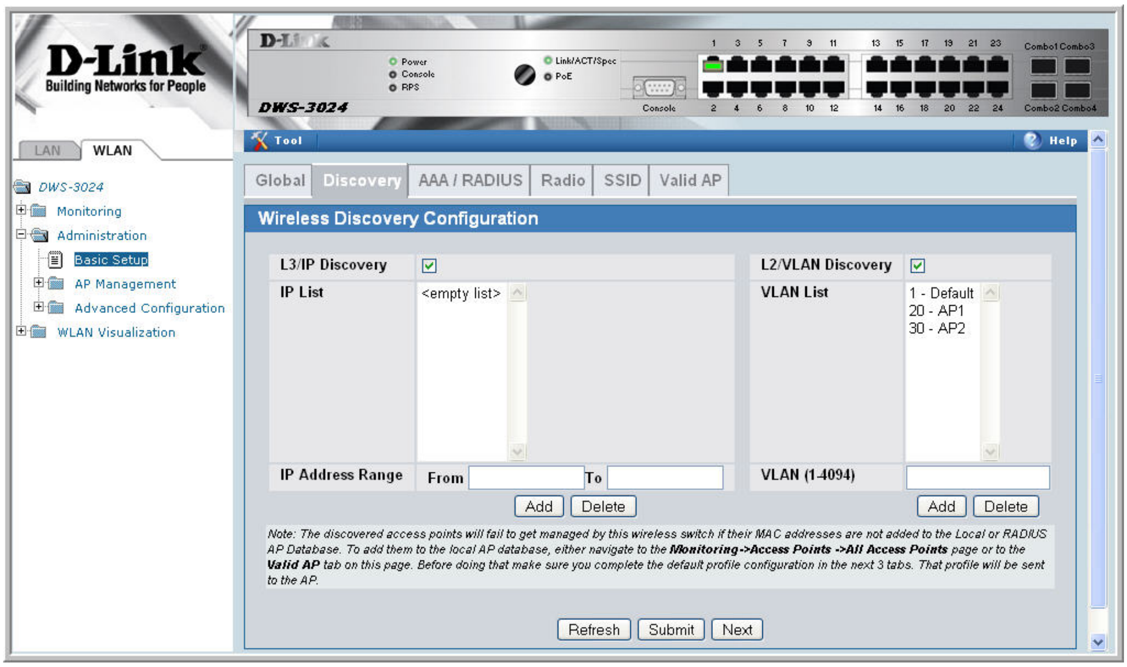
1. On the **Global** tab of the **Administration → Basic Setup** page, make sure the switch IP address is the Loopback interface address (192.168.10.254), the country code is correct, and that the **WLAN Switch Operational Status** is Enabled.



Wireless Global Configuration

Enable WLAN Switch	☑
WLAN Switch Operational Status	Enabled
IP Address	192.168.10.254
AP Authentication	□
AP MAC Validation	● Local ○ RADIUS
Country Code	GB - United Kingdom

2. Click **Next** to go to the Discovery tab on the Basic Setup page.
3. Add VLAN 20 and VLAN 30 to the **L2/VLAN Discovery** list (to allow automatic discovery of the APs connected to ports on VLANs 20 and 30), then click **Submit**.

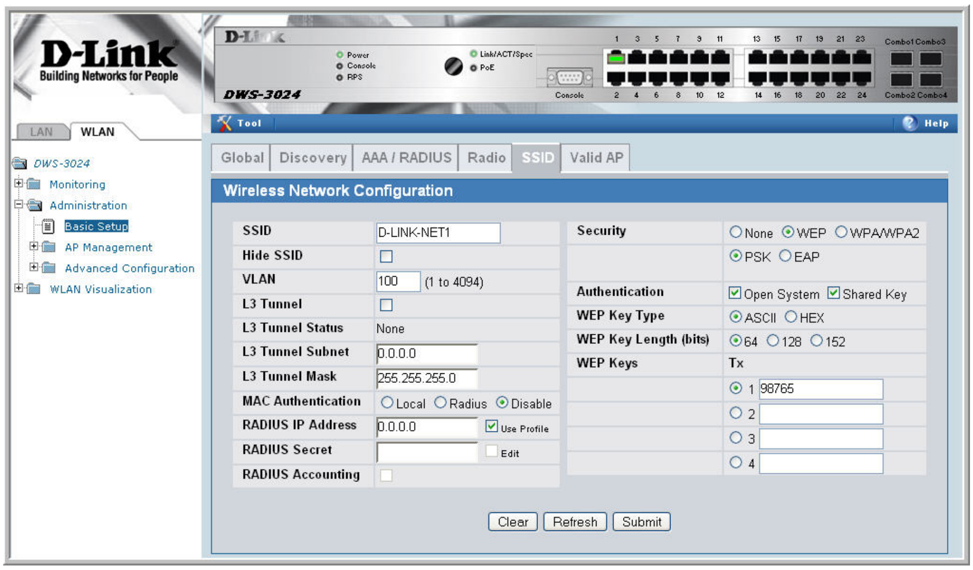


Wireless Discovery Configuration

L3/IP Discovery	☑	L2/VLAN Discovery	☑
IP List	<empty list>	VLAN List	1 - Default 20 - AP1 30 - AP2
IP Address Range	From To	VLAN (1-4094)	

Note: The discovered access points will fail to get managed by this wireless switch if their MAC addresses are not added to the Local or RADIUS AP Database. To add them to the local AP database, either navigate to the ***Monitoring->Access Points ->All Access Points*** *page or to the* ***Valid AP*** *tab on this page. Before doing that make sure you complete the default profile configuration in the next 3 tabs. That profile will be sent to the AP.*

4. Click the **SSID** tab to configure the VAP and Network settings for the APs.
5. Select the 802.11b/g radio.
6. Select the check box next to Managed SSID 2 and click **Edit**.
7. Change the following Network parameters and select **Submit**:
    a. **SSID** – D-LINK-NET1
    b. **VLAN** – 100
    c. **Security** – WEP
        - **Authentication** – Open System
        - **WEP Key Type** – ASCII
        - **WEP Key Length** – 64
        - **WEP Key 1** – 98765

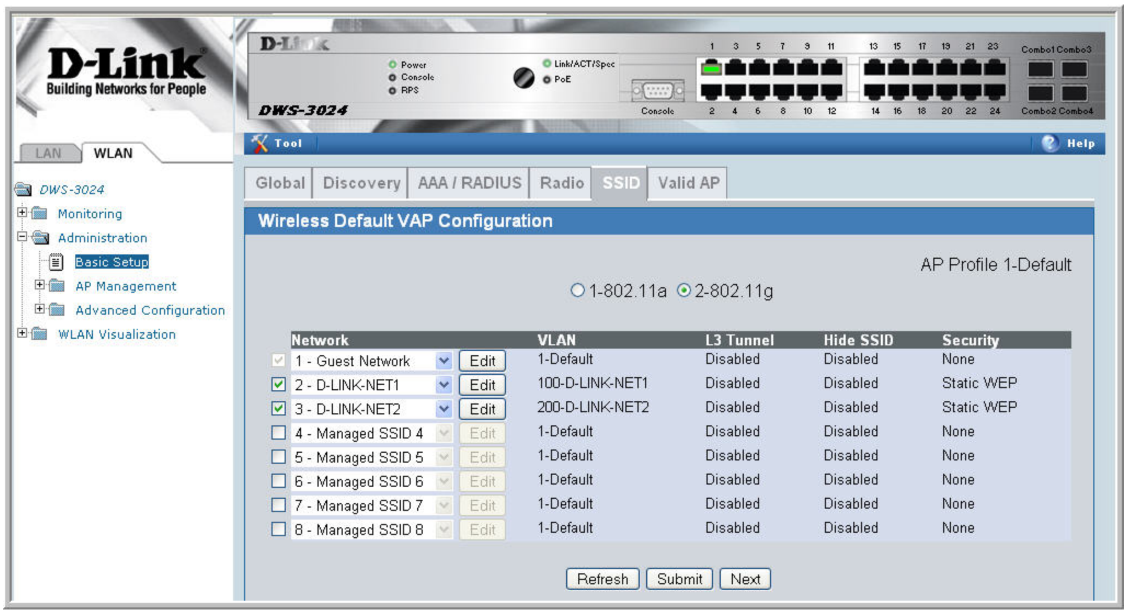


Wireless Network Configuration

SSID	D-LINK-NET1	Security	○ None ● WEP ○ WPA/WPA2
Hide SSID	□		● PSK ○ EAP
VLAN	100 (1 to 4094)		
L3 Tunnel	□	Authentication	☑ Open System ☑ Shared Key
L3 Tunnel Status	None	WEP Key Type	● ASCII ○ HEX
L3 Tunnel Subnet	0.0.0.0	WEP Key Length (bits)	● 64 ○ 128 ○ 152
L3 Tunnel Mask	255.255.255.0	WEP Keys	Tx
MAC Authentication	○ Local ○ Radius ● Disable		● 1 98765
RADIUS IP Address	0.0.0.0 ☑ Use Profile		○ 2
RADIUS Secret	□ Edit		○ 3
RADIUS Accounting	□		○ 4

Note: For convenience, the SSID created under one radio is propagated to the second radio. The SSID parameters on the second radio may then be modified.

8. To repeat the procedure and add a second secure network, return to the SSID page by clicking on the SSID tab.
9. Select the check box next to Managed SSID 3 and click **Edit**.
10. Change the following parameters and select **Submit**:
    a. **SSID** – D-LINK-NET2
    b. **VLAN** – 200
    c. **Security** – WEP
        - **Authentication** – Open System
        - **WEP Key Type** – ASCII
        - **WEP Key Length** – 64
        - **WEP Key 1** – 98765



Wireless Default VAP Configuration

AP Profile 1-Default

○ 1-802.11a ● 2-802.11g

	Network		VLAN	L3 Tunnel	Hide SSID	Security
☑	1 - Guest Network	Edit	1-Default	Disabled	Disabled	None
☑	2 - D-LINK-NET1	Edit	100-D-LINK-NET1	Disabled	Disabled	Static WEP
☑	3 - D-LINK-NET2	Edit	200-D-LINK-NET2	Disabled	Disabled	Static WEP
☐	4 - Managed SSID 4	Edit	1-Default	Disabled	Disabled	None
☐	5 - Managed SSID 5	Edit	1-Default	Disabled	Disabled	None
☐	6 - Managed SSID 6	Edit	1-Default	Disabled	Disabled	None
☐	7 - Managed SSID 7	Edit	1-Default	Disabled	Disabled	None
☐	8 - Managed SSID 8	Edit	1-Default	Disabled	Disabled	None

1.3. Save Configuration

Use the **Tool** menu to save the switch configuration.

1.4. Device Connections

This section outlines the connections needed between the Unified Switches and the APs. At this point, all the devices are ready to be connected. After the switch discovers the APs, they will become managed since the MAC addresses of the APs were added to the Valid AP database in Scenario 1 (unless you reset the configuration between scenarios in which case you would have to re-add the MAC addresses of the APs to the local database). The updated AP profile is applied to the APs upon validation

1. Connect AP1 to **port 1** of the switch
2. Connect AP2 to **port 13** of the switch
3. Wait about 60 seconds and click **Monitoring → Access Points → Managed Access Points** (Note: you might find the APs in the **Authentication Failed Access Points** page if you have not added the MAC addresses of the APs to your local database).

1.5. Verifying the Configuration

From a wireless client, verify that you can see the SSIDs for the following:

- Guest Network
- D-LINK NET1
- D-LINK NET2

1. Connect to one of the D-LINK-NET SSIDs to verify that WEP security is enforced.
2. After connecting, check the IP address that the switch DHCP server assigned.
3. Try pinging from a client on D-LINK-NET1 to D-LINK-NET2. The ping should fail because of the ACL.
4. Perform a “fast roam” from one AP to the other on one of the D-LINK-NET SSIDs (this can be simulated by pulling power on the AP you are currently associated with) and observe that your IP address does not change even though you have now associated with an AP on a

different subnet. Fast roams will not function on the Guest Network SSID because the client will be forced to acquire a new IP address.

3. Scenario 3 – L3 Overlay: 1 Unified Switch + 1 AP + 1 Remote AP

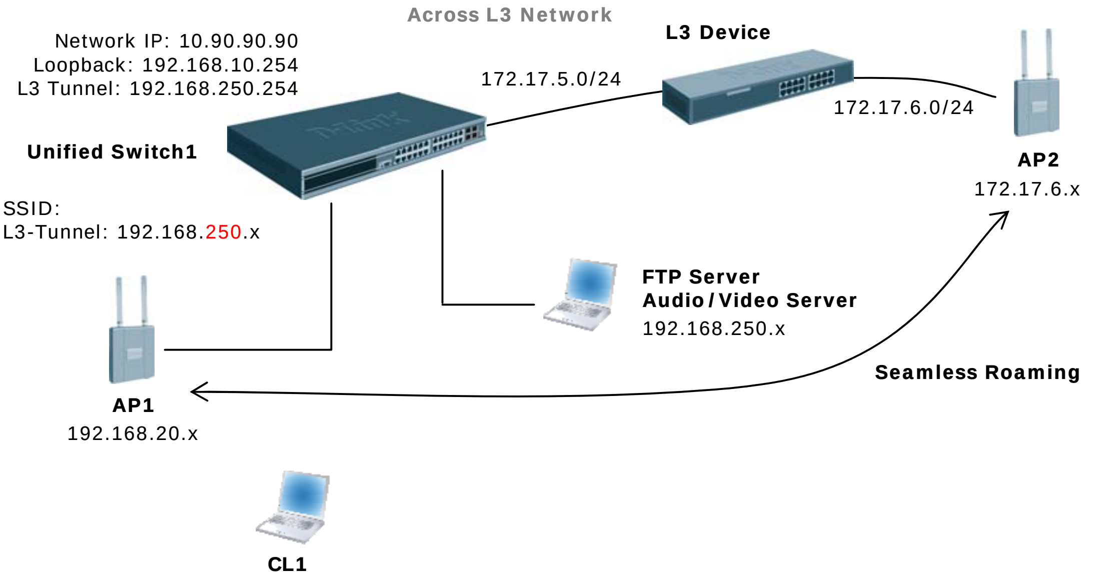
The diagram in this section shows a network configuration with a D-LINK Unified Switch connected to an L3 Device/Router. One AP is connected to the D-LINK Unified Switch, and the other is connected to the L3 device. Both APs are managed by the D-LINK Unified Switch.

This scenario uses L3 tunneling so that a client that associated with AP1 initiates an audio conversation and roams to a different subnet. In the process, the client is disassociated with AP1 and gets associated with AP2 maintaining the audio conversation.

This scenario is especially useful for you to setup a demo in customers' existing network with little change to customers' network configuration.

The objectives for this scenario include the following:

- To know how to setup the L3 tunneling (L3 Tunneling must be used since the APs are on different IP subnets and there is not a L2 path between the APs for the WLAN Network data).
- To know how to manage the remote AP and the most practical deployment into customers' existing networks.



In this scenario, the L3 device is part of the customer network. The L3 device must meet the following minimum requirements:

- One network to connect to the Unified Switch (in this scenario, the network is 172.17.5.0/24)
- One network to connect to AP2 (in this scenario, the network is 172.17.6.0/24)
- DHCP server in the AP2 network for AP and wireless client addresses

This scenario builds on the configuration from Scenario 2. Although some of the information configured in Scenario 2 does not apply to Scenario 3, you do not need to delete any of the pre-existing configurations.

In addition to the VLAN, DHCP, ACL and Unified Switch configuration performed in Scenario 2, the configuration for this scenario involves the following steps:

1. Assign a static IP address to AP2 or use a DHCP server on the customer L3 device or configure DHCP Relay on the L3 customer device to point to a DHCP Server configured on the unified switch.
2. Configure two additional VLANs and VLAN routing interfaces.
3. Configure a default route.
4. Add the IP address of AP2 to the L3 discovery list.
5. Configure and enable the L3 Tunnel network on the Unified Switch.
6. Apply the updated profile to the APs.
7. Save the configuration.

The following table shows a summary of the interfaces or devices you configure, along with their IP address and port information. You configure the entries in **bold** in this scenario. All other entries were configured in previous scenarios.

Interface/Device	IP Address	Port
Unified Switch Management Interface	10.90.90.90/8	Any unused
Unified Switch Loopback Interface	192.168.10.254/32	Logical only
Unified Switch L3 Tunnel Interface	**192.168.250.254/24**	**Logical only**
Unified Switch Interface to L3 Device	**172.17.5.253/24**	**0/24**
L3 Device Interface to Unified Switch	**172.17.5.254/24**	**L3 device port**
FTP Server	**192.168.250.x/24**	**0/21**
Audio/Video Server	**192.168.250.x/24**	**0/22**
AP1	192.168.20.x/24	0/1
AP2	**172.17.6.1/24**	**L3 device port**
Clients on D-LINK-NET1	192.168.100.x/24	Wireless
Clients on D-LINK-NET2	192.168.200.x/24	Wireless
Clients on L-3 Tunnel	**192.168.250.x/24**	**Wireless**

3.1. Configuring LAN Settings

All of the features you configure in this section are within the **LAN** tab on the D-LINK Unified Switch.

3.1.1. Configure the VLANs

The summary information for the VLAN configuration is as follows (the **bold** entries are new for this scenario, and the grey entries were configured in Scenario 2):

VLAN ID	VLAN Name	Include Ports	IP Address
VLAN 20 (Interface 4/1)	AP1	Port 0/1	192.168.20.254
VLAN 30 (Interface 4/2)	AP2	Port 0/13	192.168.30.254
VLAN 100 (Interface 4/3)	D-LINK-NET1	Ports 0/1 and 0/13	192.168.100.254
VLAN 200 (Interface 4/4)	D-LINK-NET2	Ports 0/1 and 0/13	192.168.200.254
VLAN 5 (Interface 4/5)	**Customer-NET**	**Port 0/24 (Untag)**	**172.17.5.253**
VLAN 250 (Interface 4/6)	**L3-Tunnel-NET**	**Ports 0/21 and 0/22 (Untag)**	**192.168.250.254**

Also, the default VLAN (PVID) for port 0/24 is 5, and the default VLAN for ports 0/21 and 0/22 is 250.

Use the following steps to create and configure VLAN 5, and then repeat them to configure VLAN 250. Refer to the table for information about what value to configure for each VLAN.

1. From the LAN tab on the switch Web interface, click **L2 Features → VLAN → VLAN Configuration**.
2. Select **Create** from **VLAN ID and Name** pull down menu.
3. Enter the **VLAN ID.**
4. Enter **VLAN Name.**
5. On the Slot/Port row for the port to include in the VLAN, select **Include** from the **Participation** drop-down menu for the ports listed in the table.
6. Click **Submit.**

Configure the Port VLAN ID for ports 0/21, 0/22, and 0/24.

1. From the LAN tab on the switch Web interface, click **L2 Features → VLAN → Port Configuration**.
2. Select port 0/21 from the Slot/Port drop-down menu.
3. Enter 250 in the **Port VLAN ID** field.
4. Click **Submit**.
5. Select port 0/22 from the Slot/Port drop-down menu.
6. Enter 250 in the **Port VLAN ID** field.
7. Click **Submit**.
8. Select port 0/24 from the Slot/Port drop-down menu.
9. Enter 5 in the **Port VLAN ID** field.
10. Click **Submit**.
11. After you have repeated the steps to configure all four VLANs, use the **Monitoring → VLAN Summary→ VLAN Status** and **VLAN Port Status** pages to verify that the VLANs and the ports are configured properly.

3.1.2. Configure VLAN Routing

You need to configure two VLAN routing interfaces:

- An interface for the FTP/Audio/Video server that is attached to the L3 Tunnel subnet and is used for WLAN clients on the Tunneled SSID Network.
- An interface that connects to the customer network (simulated here by the L3 device).

To configure the new VLAN routing interfaces, use the following steps.

1. Select the LAN tab from the navigation panel and click **L3 Features → VLAN Routing Configuration**.

2. To create a routing interface for VLAN 5, enter 5 into the **VLAN ID** field and select **Create**.

   This creates a logical routing interface with the slot/port designation of 4/5 for VLAN 5.
3. To create a routing interface for VLAN 250, enter 250 into the **VLAN ID** field and select **Create**.

   This creates a logical routing interface with the slot/port designation of 4/6 for VLAN 250.
4. Navigate to **L3 Features → IP → Interface Configuration**.
5. Select interface 4/5 from the Slot/Port drop-down menu and enter the following information:
   a. IP Address: 172.17.5.253
   b. Subnet Mask: 255.255.255.0
   c. Routing Mode: Enable
6. Click **Submit**.
7. Select interface 4/6 from the Slot/Port drop-down menu and enter the following information:
   d. IP Address: 192.168.250.254
   e. Subnet Mask: 255.255.255.0
   f. Routing Mode: Enable
8. Click **Submit**.
9. Verify the VLAN Routing information on the **Monitoring → L3 Status → VLAN Routing Summary** page.

3.1.3. Configure Routing

You must configure routes on the Unified Switch for integration with the simulated customer network. You can either configure static routes for each network you need access to at the Unified Switch or you can configure a default route. The Unified Switch at a minimum requires IP access to the "remote" AP that is connected via the L3 router to allow the Unified Access System to manage that remote AP. Other routes (or a default route) provide access for clients to reach other networks.

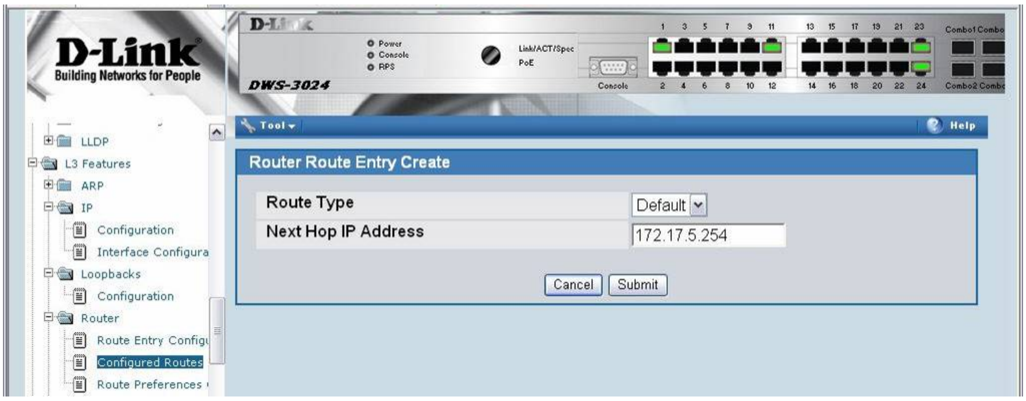
The following *default route* can be added on the Unified Switch.

Customer Network Address	Mask	Next Hop IP Address
0.0.0.0	0.0.0.0	172.17.5.254

Note: Interface *172.17.5.254* is a counterpart router interface on the L3 device attached to port 0/24 on the Unified Switch. Port 0/24 is associated with the VLAN routing interface 5, which has an IP address of 172.17.5.253.

Use the following procedures to create the default route.

1. From the LAN tab, navigate to **L3 Features → Router → Configured Routes**.
2. Select **Default** from the Route Types drop-down menu.
3. In the Next Hop IP Address field, enter 172.17.5.254, which is the IP address of the interface on the "customer" L3 device that is connected to port 0/24.



Router Route Entry Create

Route Type	Default
Next Hop IP Address	172.17.5.254

Proper static routes to Unified Switch must be also configured on the "customer" L3 device as well. In a customer environment, you would need to configure the following static routes on the customer's L3 device.

Network Address	Mask	Next Hop IP Address
192.168.10.0	255.255.255.0	172.17.5.253

Note: The above static route provides an IP path back to the loopback interface on the Unified Switch for the remote AP to access to become managed by the Unified Access System. Without additional routes, wired clients on the customer's L3 device will not be able to reach other subnets on the Unified Switch. This includes connectivity between wireless clients on AP1 and AP2 if they associate with a non-Tunneled SSID.

##

Setting Example

Settings for L3 Switch:

V5 (Connect to Unified Switch)

```
  #config vlan default delete 1-16
  #create vlan v5 tag 5
  #config vlan v5 add untagged 1-8
  #create ipif net2 172.17.5.254/24 v5
```

V6 (Connect to AP2)

```
  #create vlan v6 tag 6
  #config vlan v6 add untagged 9-16
  #create ipif net3 172.17.6.254/24 v6
```

Set static route

```
  #create iproute 192.168.10.0/24 172.17.5.253
```

Enable Jumbo Frame (Set MAX MTU size for all port)

```
  #enable jumbo_frame
  #save
```

Settings for AP2 via Telnet:

```
  #set management dhcp-status down
  #set management static-ip 172.17.6.1
```

(Telnet again with new IP)

```
  #set management static-mask 255.255.255.0
  #set static-ip-route gateway 172.17.6.254
  #save-running
```

3.1.4. DHCP Server

You need to configure a new IP address pool for the clients that connect to the L3 Tunnel network (the FTP/Audio/Video server and the wireless clients that connect to the L3 Tunnel SSID). The DHCP server should already be enabled from Scenario 2.

1. From the LAN menu, click Administration → DHCP Server → Global Configuration
2. In the **Admin Mode** field, select Enable, then click **Submit** to enable the DHCP server..
3. Select **Pool Configuration** in the Navigation tree.
4. For the new address pool, select **create** and specify the following settings:

Pool Name	Tunnel
Type of Binding	Dynamic
Network Number	192.168.250.0
Network Mask	255.255.255.0
Days	1 day
Hours	0
Minutes	0
Default Router Address	192.168.250.254

5. Click **Submit** to create the address pool.

3.1.4.1. DHCP on the Customer Network

For this scenario, AP2 resides in the “customer” network. Configure the L3 device in the customer network to assign the IP address 172.17.6.1 to AP2. You will use this IP address to add to the L3/IP discovery list.

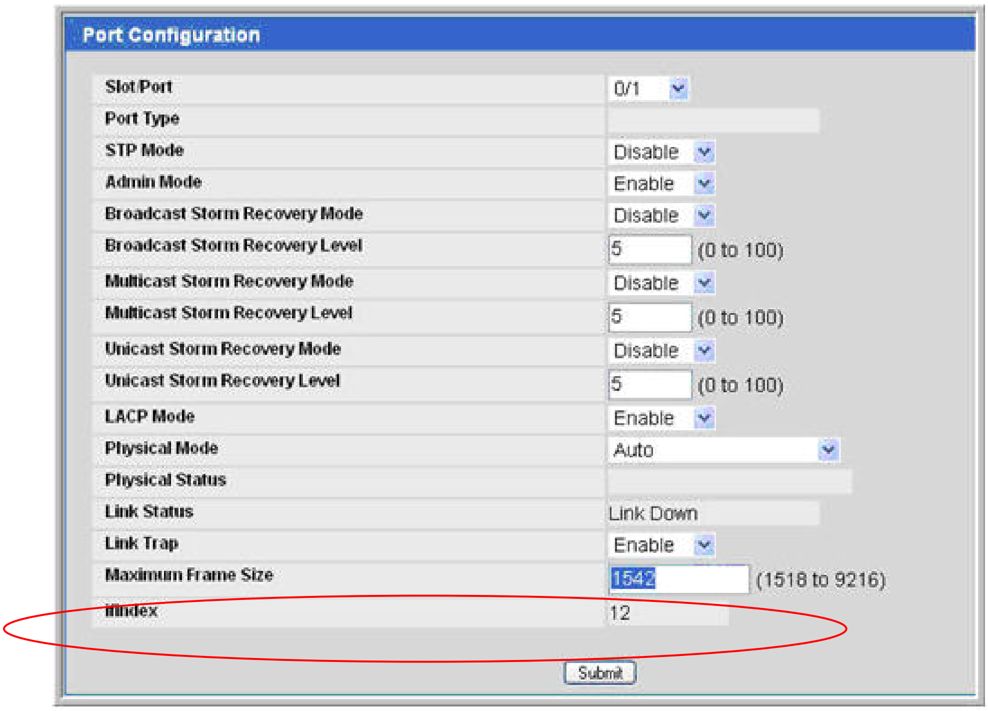
3.1.5. Setting the MTU Size

The MTU determines the maximum size of a packet that can be transmitted through a port in one frame. The default MTU size for the ports on the D- Link Unified Switch is 1518 bytes. Packets that use the L3 tunnel have an extra 20 bytes in the header for encapsulation. To support these larger frames, you can increase the MTU size on all intermediate ports and unified switch ports. The AP can transmit and receive frames of up to 1542 bytes on the LAN port

If you use tunneling only for IP telephony, or if you set the MTU size on all wireless clients that use tunneling to 1480, you do not need to increase the MTU size in the network.

The following example shows how to change the MTU size on port 0/1 to 1542 bytes. You will need to repeat the steps for port 0/24. Also, make sure the port on the “customer” L3 device where AP2 is attached has an MTU size of at least 1542.

1. From the LAN tab, access the **Administration > Port Configuration > Port Configuration** page.
2. From the **Slot/Port** or **Unit/Slot/Port** field, select the port to configure from the drop-down list, or select All to configure all ports.
3. Enter 1542 as the MTU size in the **Maximum Frame Size** field.
4. Click **Submit** to apply your changes to the running configuration.



Port Configuration

Slot/Port	0/1	
Port Type		
STP Mode	Disable	
Admin Mode	Enable	
Broadcast Storm Recovery Mode	Disable	
Broadcast Storm Recovery Level	5	(0 to 100)
Multicast Storm Recovery Mode	Disable	
Multicast Storm Recovery Level	5	(0 to 100)
Unicast Storm Recovery Mode	Disable	
Unicast Storm Recovery Level	5	(0 to 100)
LACP Mode	Enable	
Physical Mode	Auto	
Physical Status		
Link Status	Link Down	
Link Trap	Enable	
Maximum Frame Size	1542	(1518 to 9216)
ifIndex	12	

3.2. *Configuring WLAN Settings*

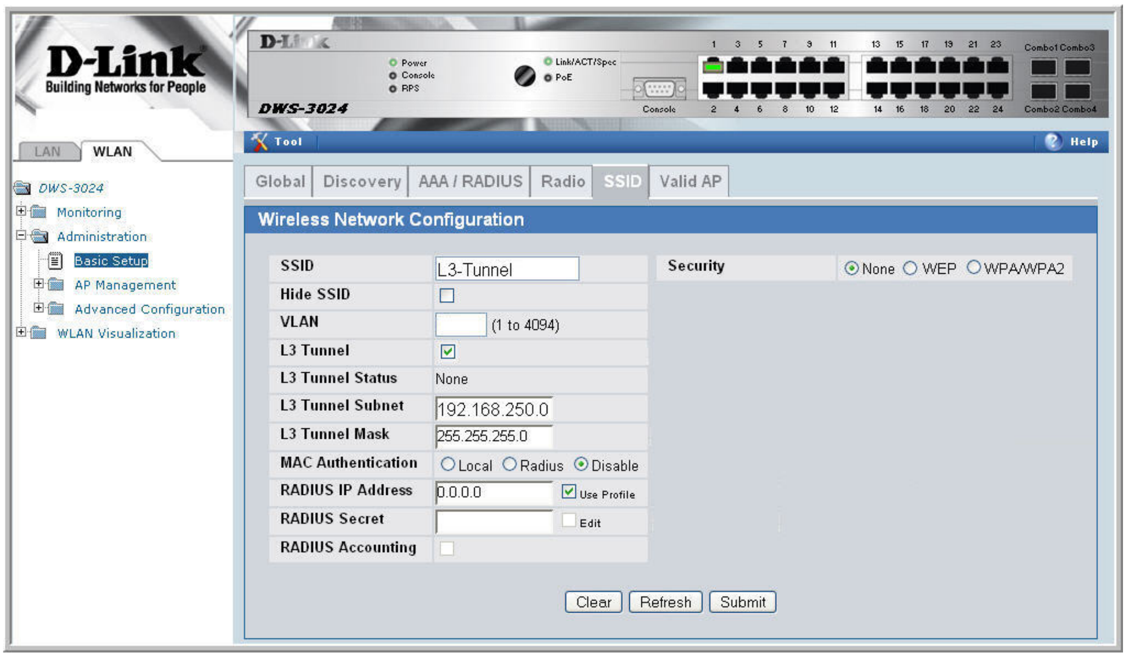
All of the features you configure in this section are within the **WLAN** tab on the D-LINK Unified Switch.

3.2.1. Configure the Basic Settings

Use the following steps to configure the Unified Switch and the APs.

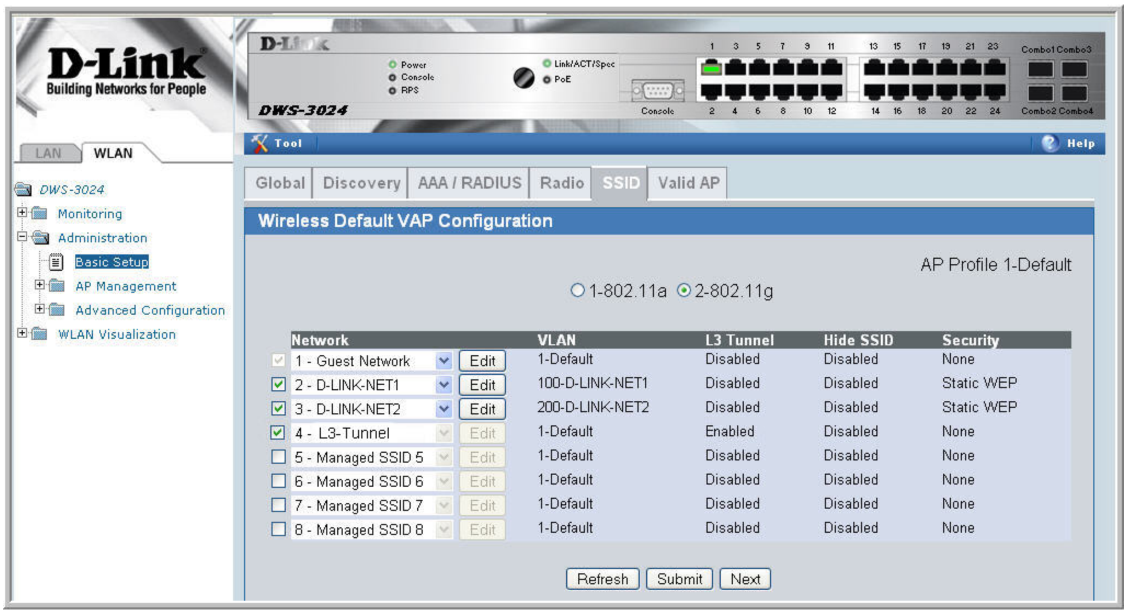
1. On the **Global** tab of the **Administration → Basic Setup** page, make sure the switch IP address is the Loopback interface address (192.168.10.254), the country code is correct, and that the **WLAN Switch Operational Status** is Enabled.
2. Click **Next** to go to the Discovery tab on the Basic Setup page.
3. Add the IP address for AP2 (172.17.6.1, which is on the "customer" network) to the **L3/IP Discovery** list, and then click **Submit** (Note: since you do not know for sure which IP address the DHCP Server on the "customer" network will provide to AP2, you can configure a range of IP addresses to add to the L3 Discovery list).
4. Click the **SSID** tab to configure the VAP and Network settings for the L3-Tunnel network..
5. Select the 802.11b/g radio.
6. Select the check box next to Managed SSID 4 and click **Edit**.
7. Change the following Network parameters and select **Submit**:
    - b. **SSID** – L3-Tunnel
    - c. **L3 Tunnel Check Box**: Enabled
    - d. **L3 Tunnel Subnet**: 192.168.250.0
    - e. **L3 Tunnel Mask**: 255.255.255.0
    - f. **Security**: WPA/WPA2 – WPA Personal
    - g. **WPA Versions**: WPA & WPA2
    - h. **WPA Ciphers**: TKIP & CCMP

i. **Passphrase**: 1234567890



Wireless Network Configuration

SSID	L3-Tunnel	Security	● None ○ WEP ○ WPA/WPA2
Hide SSID	□		
VLAN	(1 to 4094)		
L3 Tunnel	☑		
L3 Tunnel Status	None		
L3 Tunnel Subnet	192.168.250.0		
L3 Tunnel Mask	255.255.255.0		
MAC Authentication	○ Local ○ Radius ● Disable		
RADIUS IP Address	0.0.0.0 ☑ Use Profile		
RADIUS Secret	□ Edit		
RADIUS Accounting	□		



Wireless Default VAP Configuration

AP Profile 1-Default

○ 1-802.11a ● 2-802.11g

	Network		VLAN	L3 Tunnel	Hide SSID	Security
☑	1 - Guest Network	Edit	1-Default	Disabled	Disabled	None
☑	2 - D-LINK-NET1	Edit	100-D-LINK-NET1	Disabled	Disabled	Static WEP
☑	3 - D-LINK-NET2	Edit	200-D-LINK-NET2	Disabled	Disabled	Static WEP
☑	4 - L3-Tunnel	Edit	1-Default	Enabled	Disabled	None
□	5 - Managed SSID 5	Edit	1-Default	Disabled	Disabled	None
□	6 - Managed SSID 6	Edit	1-Default	Disabled	Disabled	None
□	7 - Managed SSID 7	Edit	1-Default	Disabled	Disabled	None
□	8 - Managed SSID 8	Edit	1-Default	Disabled	Disabled	None

3.2.2. Apply the AP Profile

Because the AP profile that the APs use has changed and you have not disconnected AP1, you can manually re-apply the AP profile settings in order to update it with the new L3-Tunnel network. The new profile will automatically be applied to AP2 after you connect it to the L3 device and the D-LINK Unified Switch discovers and validates it.

1. To apply the updated AP profile, access the **Administration → Advanced Configuration → AP Profiles** page under the WLAN tab.
2. Select the check box next to Profile1 – Default.
3. Click **Apply** to apply the new profile to AP1.

3.3. Save Configuration

Save the switch configuration.

3.4. Device Connections

This section outlines the connections needed between the Unified Switches and the APs. At this point, all the devices are ready to be connected. After the switch discovers the APs, they will become managed since the MAC addresses of the APs were added to the Valid AP database in Scenario 1.

1. Make sure AP1 is connected to **port 1** of the switch
2. Connect **port 0/24** to a port on the "customer" L3 device in the 172.17.5.0 network.
3. Connect **ports 0/22** and **0/21** to the FTP/Audio/Video devices.
4. Connect AP2 to a port in the 172.168.6.0 network on the "customer" L3 device.
5. Wait about 60 seconds and click **Monitoring → Access Points → Managed Access Points** to make sure that both APs are managed by the switch.

3.5. Verifying the Configuration

1. Make sure that the L3 Tunnel Status is "Configured" for the L3-Tunnel network (on the Wireless Network Configuration page of the L3-Tunnel network **Administration → Basic Setup → SSID**
2. From a wireless client, verify that you can see the SSIDs for the following:
   - Guest Network
   - D-LINK NET1
   - D-LINK NET2
   - L3-Tunnel
3. Connect to the L3-Tunnel SSID with WPA2-PSK security configured on the client.
4. After connecting, check the IP address that the switch DHCP server assigned.
5. Start the Roaming Test.

3.6. Testing the L3 Roaming Feature

3.6.1. Simulated Roam via Power Down of AP

The following procedure shows how to perform an L3 Tunnel roaming test.

1. Use your laptop to test wireless connection by associating to the "L3-Tunnel" SSID Network, and check if you're getting the IP address correctly from the Unified Switch's DHCP server on the Tunnel subnet.
2. Once wireless connectivity is confirmed, you can check which AP your laptop connects to [WLAN/ Monitoring/ Client/ Associated Clients].
3. Start to Ping one of the LAN interfaces (172.17.5.253 or .254) or its loopback interface (192.168.10.254).

4. Disconnect the AP which your laptop is associated with and see how soon you can roam to the other AP. Normally 1 ping loss is observed when roaming. (**Note:** Please see section 3.6.1 below for an alternative mechanism for simulating a roam)
5. You can repeat step 2-4 and observe your laptop roam from AP to AP without changing IP, and with limited packet loss.

Note: You will not be able to seamlessly roam between AP1 and AP2 using the other SSIDs since these are not configured for L3 Tunneling and these APs are on different IP subnets which will require the client to obtain a new IP address on a non tunneled SSID.

3.6.2. Simulated Roam via Disabling Radios

The following procedure shows how to simulate a roam by disabling the radio the client is currently associated with. By using this method, the link between the AP and the Unified Switch will not go down and therefore the local route will not be removed and the above mentioned routing loop issue will not happen.

1. Use your laptop to test wireless connection by associating to the “L3-Tunnel” SSID Network, and check if you’re getting the IP address correctly from the Unified Switch’s DHCP server on the Tunnel subnet.
2. Once wireless connectivity is confirmed, you can check which AP your laptop connects to [WLAN/ Monitoring/ Client/ Associated Clients].
3. Start to Ping one of the LAN interfaces (172.17.5.253 or .254) or its loopback interface (192.168.10.254).
4. Enable AP “debug” mode to allow direct Telnet access to the APs CLI [WLAN/Administration/AP Management/Advanced].
5. Open a Telnet session to the IP address of the AP which your client has associated with and login.
6. Disable the radios with this command: “set radio all status down”. You will observe the client roam to the other AP with minimal ping loss.

3.6.3. Real Roam

A real-world roam involves physically moving from near one AP to the other such that your client will automatically associate with the closer AP of stronger signal strength. This is best shown when the APs are adequately separated to allow signal strength decrease as you move away one AP and signal strength increase from the other AP as you move nearer. Wireless VoIP phones are the best clients to use since they are tuned to roam if a stronger signal is detected from another nearby AP. PC clients are not tuned for these rapid roams and therefore will often allow the signal strength to decrease significantly before selecting a stronger signal AP to associate with – this can cause traffic loss simply associated with a weak signal. To facilitate the client’s decision to roam an antenna can be connected to one of the APs after you have already associated with the other.

3.7. Logs & Traps

The administrator can enable or disable SNMP traps sent from the Unified Switch and the trap destinations. The traps can be enabled or disabled by traversing to **Administration → Advanced Configuration → Global** in the **WLAN** tab. In managed mode the AP doesn’t generate any traps. The list below shows all the possible traps generated on the Unified Switch:

Note: All traps are disabled by default.

WS Traps

1. WS Enabled
2. WS Disabled
3. WS Managed AP Database Full
4. WS Managed AP – AP Neighbor List Full
5. WS Managed AP – Client Neighbor List Full
6. WS-AP Failure List Full
7. RF Scan AP List Full
8. Client Association Database Full
9. Client Failure List Full

Peer WS Traps

10. Peer WS Discovered
11. Peer WS Failed
12. Peer WS Unknown Protocol Discovered

AP State Traps

13. WS Managed AP Discovered
14. WS Managed AP Failed
15. WS Managed AP Unknown Protocol Discovered

AP Failure Traps

16. WS-AP Association Failure
17. WS-AP Authentication Failure

Rogue AP Traps

18. RF Scan Rogue AP Detected

RF Scan Traps

19. RF Scan New AP Detected
20. RF Scan New Client Detected
21. RF Scan Ad-Hoc Client Detected.

Client State Traps

22. Client Association Detected
23. Client Disassociation Detected
24. Client Roam Detected

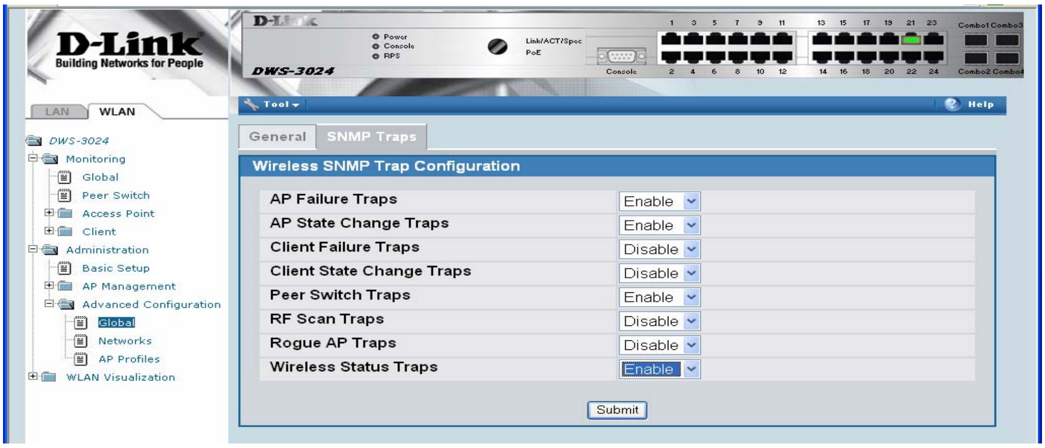
Client Failure Traps

25. Client Association Failure
26. Client Authentication Failure

Load Balancing Traps Per AP Per Radio Basis

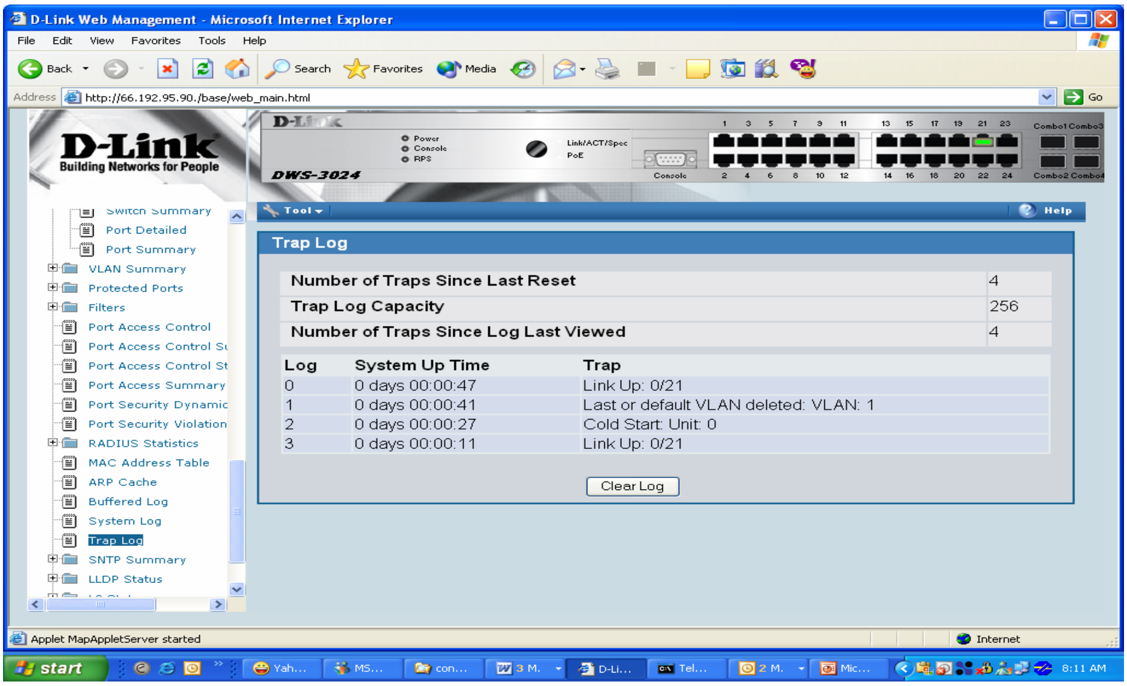
27. Wireless bandwidth utilization exceeded

The trap logs can be viewed by traversing to DWS-3024 -> Monitoring -> Trap Logs in the ***LAN*** tab.



Wireless SNMP Trap Configuration

AP Failure Traps	Enable
AP State Change Traps	Enable
Client Failure Traps	Disable
Client State Change Traps	Disable
Peer Switch Traps	Enable
RF Scan Traps	Disable
Rogue AP Traps	Disable
Wireless Status Traps	Enable



Trap Log

Number of Traps Since Last Reset	4
Trap Log Capacity	256
Number of Traps Since Log Last Viewed	4

Log	System Up Time	Trap
0	0 days 00:00:47	Link Up: 0/21
1	0 days 00:00:41	Last or default VLAN deleted: VLAN: 1
2	0 days 00:00:27	Cold Start: Unit: 0
3	0 days 00:00:11	Link Up: 0/21

3.8. Syslog Configuration

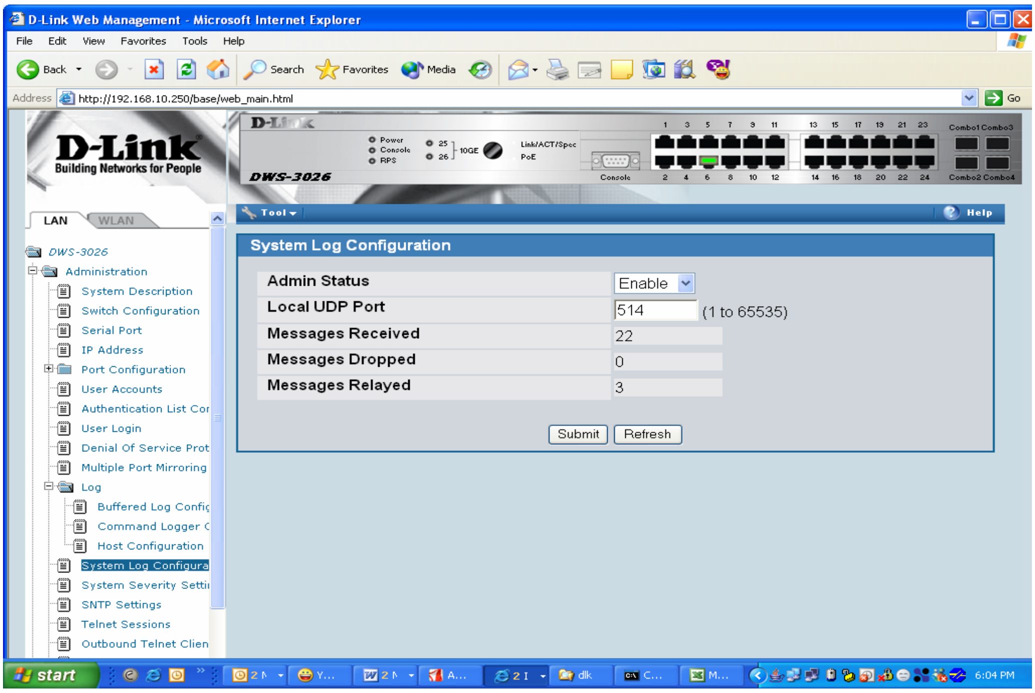
Enable Syslog by traversing to DWS-3026 -> Administration -> System Log Configuration and selecting ***submit***. Then, configure syslog server by providing the server ***IP Address*** and selecting the level of ***Severity Filter*** and selecting ***submit***.

3.9. Debug

This section outlines information required for engineering debugging. Connect your laptop/PC to Unified Switch’s serial console or telnet to the IP address of the switch and capture the following information:

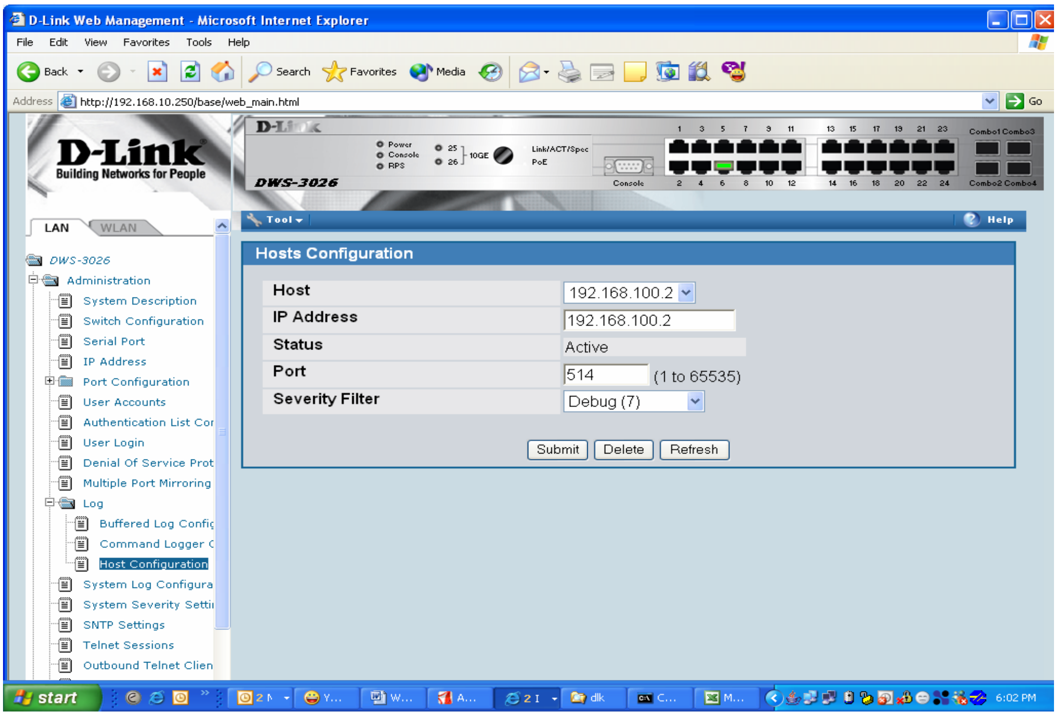
1. show running-config
2. show logging traplogs

3. show logging buffered



System Log Configuration

Admin Status	Enable
Local UDP Port	514 (1 to 65535)
Messages Received	22
Messages Dropped	0
Messages Relayed	3



Hosts Configuration

Host	192.168.100.2
IP Address	192.168.100.2
Status	Active
Port	514 (1 to 65535)
Severity Filter	Debug (7)

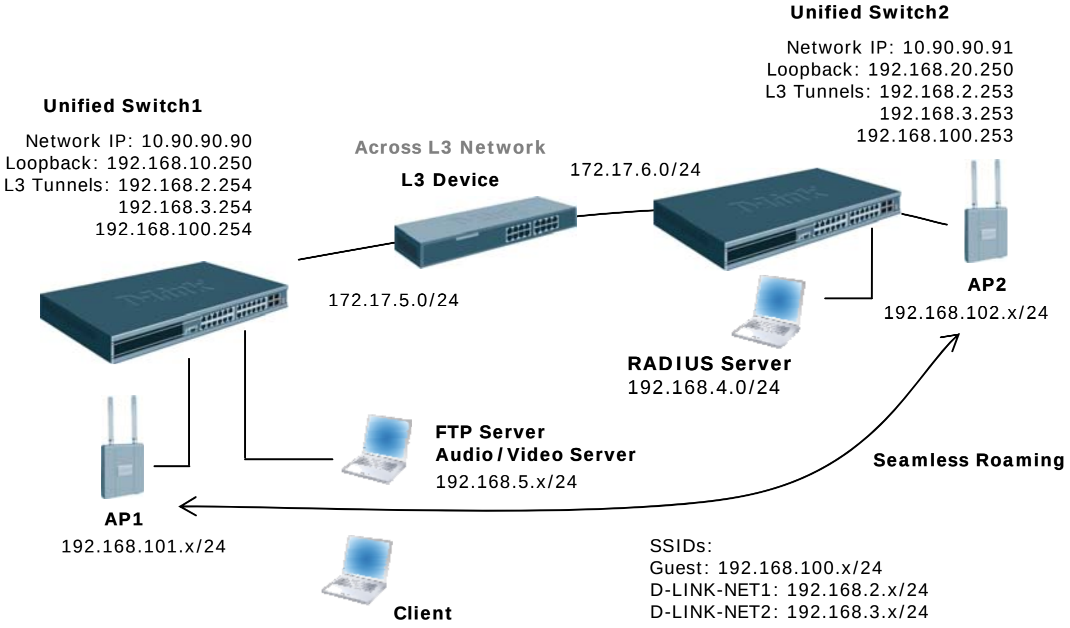
4. Scenario 4 – L3 Edge: 2 Switches + 2 APs

This scenario involves a larger Unified Switch managed network, which consists of multiple Unified Switches (in this example there are two) connected over a L3 core network.

Also, in this scenario, the L3-Tunnel network is updated to require WPA2 authentication for “fast authenticated roaming.” The security is WPA Enterprise, which requires a RADIUS server.

Scenario 4 has the following objectives:

- To know how to setup the multiple Unified Switch deployment as peer switches across a L3 core.
- To know how to setup WPA2-EAP Authentication



4.1. Overview

The following tables show a summary of the interfaces on the devices you configure, along with their IP address and port information as well as the VLANs, DHCP pools, etc. This configuration starts from scratch and therefore you should clear the configuration on the unified switches from the previous scenarios.

Interface/Device	**VLAN ID/Name**	**IP Address**	**Port**
Switch1 Management Interface	NA	10.90.90.90/8	Any unused L2 port
Switch1 Loopback Interface	NA	192.168.10.250/32	Logical only
Switch1 L3 Tunnel Interface	2 - RD	192.168.2.254/24	Logical only
Switch1 L3 Tunnel Interface	3 - Sales	192.168.3.254/24	Logical only
Switch1 L3 Tunnel Interface	100 - Guest	192.168.100.254/24	Logical only
Switch1 Interface to L3 Device	10 - Core	172.17.5.253/24	0/24
L3 Device Interface to Switch1	NA	172.17.5.254/24	L3 device port
Switch2 Management Interface	NA	10.90.90.91/24	Any unused
Switch2 Loopback Interface	NA	192.168.20.250/32	Logical only
Switch2 L3 Tunnel Interface	2 - RD	192.168.2.253/24	Logical only
Switch2 L3 Tunnel Interface	3 - Sales	192.168.3.253/24	Logical only
Switch2 L3 Tunnel Interface	100 - Guest	192.168.100.253/24	Logical only
Switch2 Interface to L3 Device	10 - Core	172.17.6.253/24	0/24
L3 Device Interface to Switch2	NA	172.17.6.254/24	L3 device port
FTP or other Server on Switch1	5 - Server	192.168.5.254/24 192.168.5.x/24 for server	0/13
RADIUS Server on Switch2	4 - Server	192.168.4.254/24 192.168.4.x/24 for server	0/13
AP1 on Switch1	101 – AP1	192.168.101.254/24 192.168.101.x/24 for AP	0/1
AP2 on Switch2	102 – AP2	192.168.102.254/24 192.168.102.x/24 for AP	0/1
DHCP for Clients on Guest SSID	NA	192.168.100.x/24	Wireless
DHCP for Clients on D-LINK-NET1 SSID	NA	192.168.2.x/24	Wireless

DHCP Clients on D-LINK-NET2 SSID	NA	192.168.3.x/24	Wireless

4.2. *Switch1 & Switch2 LAN Configuration*

The configuration in this section takes place on Unified Switch1 and Unified Switch2, and all features are under the LAN tab on the navigation panel. Please follow the steps you have learned from previous scenarios to configure the VLANs, interfaces, and addresses on the systems.

4.2.1. DHCP

Configure DHCP Server parameters and pools on Unified Switch1 to provide addresses for AP1, Guest, Sales, and RD Tunneled WLAN Clients and for AP2 on Unified Switch2.

4.2.2. Configure routes on Switch1, Switch2, and L3 device

You must configure routes on the Unified Switch and L3 core device to provide IP connectivity between the Unified Switches, APs, and servers. You can either configure static routes for each network you need access to at the Unified Switch or you can configure a default route. The Unified Switch at a minimum requires IP access to the other Unified Switch to allow peering to occur and the APs must have IP access to the RADIUS server for WPA2. Other routes (or a default route) provide access for clients to reach other networks.

The following *default* and *static* routes should be configured.

Device	**Network Address**	**Mask**	**Next Hop IP Address**
Unified Switch1	0.0.0.0	0.0.0.0	172.17.5.254
Unified Switch2	0.0.0.0	0.0.0.0	172.17.6.254
L3 Device	192.168.101.0	255.255.255.0	172.17.5.253
L3 Device	192.168.102.0	255.255.255.0	172.17.6.253
L3 Device	192.168.4.0	255.255.255.0	172.17.6.253
L3 Device	192.168.10.0	255.255.255.0	172.17.5.253
L3 Device	192.168.20.0	255.255.255.0	172.17.6.253
L3 Device	192.168.5.0	255.255.255.0	172.17.5.253

Note: The static route toward AP1, AP2, and the Radius server is needed only for WPA2-EAP authentication.

Note: A default route above will direct all unknown IP traffic from the Unified Switch to the “customer” L3 switch and configured a route on the L3 switch to direct traffic to the Unified Switch to reach the AP2 subnet a routing loop will occur when you pull power on the AP connected to the Unified Switch. This occurs because when you pull power to the AP, the link to the switch goes down and if this was the only link on the AP1 subnet, the local route will also go down. The Unified Switch continues to attempt communications with the AP for approximately a minute until it decides that the AP has failed. Since the Unified Switch no longer has an IP route to the APs subnet however, it will forward the traffic to the configured default gateway which is on the “customer” L3 device which in turn might have a route pointing back to the Unified Switch – causing a routing loop. The loop will saturate the link between the Unified Switch and the L3 device and can cause the Unified Switch to lose communications with the “remote” AP causing the wireless demo network to go down. This issue will resolve itself after the Unified Switch declares AP1 failed. In a real-world environment most likely the AP will not fail, and a roam will occur because of client movement. If an AP does fail and the routes are configured in the manner described above, a short interruption of service could be observed. (Please see section 4.6.1 for a description of how to demonstrate a roam without the chance of a routing loop).

4.2.3. Set the MTU Size

Configure the interface MTU size appropriate throughout the network to support the larger frames potentially involved in L3 Tunneling.

4.3. Configure WLAN Settings

Configure the WLAN parameters to support the 3 Tunneled SSID Networks on both Unified Switch1 and Unified Switch2. Configure the "Guest" SSID to use no security, "D-LINK-NET1" to use WPA2 (see below), and "D-LINK-NET2" to use Static-WEP. Provide the L3 Tunnel Subnet addresses in the configuration.

4.3.1. WPA2 Configuration

To support WPA2, enable "wpa-enterprise" security mode, configure the WPA Ciphers to use TKIP and CCMP, and include WPA version WPA2. Furthermore, configure the IP address and configured secret for the Radius server in the AP Profile (192.168.4.1). You will also need to appropriately configure your client to support WPA2 which might require a client OS update.

4.3.2. Configure Discovery

Configure WLAN Discovery parameters on Unified Switch1 and Unified Switch2. Use IP/L3 Discovery on Unified Switch1 and/or Unified Switch 2 to discover the other peer switch across subnets (in other words, add the loopback address of Unified Switch 2 into the IP discovery list for Unified Switch 1). Use L2/VLAN Discovery on Unified Switch 1 and Unified Switch 2 to discover the APs on VLANs 101 and 102 respectively (in other words, add VLAN 101 to the L2 discovery list on Unified Switch 1 and VLAN 102 to the discovery list on Unified Switch 2).

4.3.3. Connections

Connect devices and verify that APs move to managed state. You will need to add the APs MAC addresses into your local AP database.

4.4. Configure the RADIUS Server

Since WPA Enterprise (WPA2) uses a RADIUS server to authenticate clients, you must configure a client entry for the AP, which makes requests to the RADIUS server on behalf of the clients, and an entry for each of the users. In this example, you only add one user entry to the RADIUS database.

This configuration is applicable to only ***FreeRadius*** (http://www.freeradius.net/) radius server. The configurations in this section involve the following two files:

- *C:\Program Files\FreeRADIUS.net-1.1.1-r0.0.1\etc\radd\client.conf*
- *C:\Program Files\FreeRADIUS.net-1.1.1-r0.0.1\etc\radd\users*

1. Add a client entry for AP1 to the *clients.conf* file:

   ```
   client 192.168.101.0/24 {
         secret          = secret
         shortname  = my-ap1
   }
   ```

   Note: The secret is the same as the one added to the RADIUS Secret field in the D-LINK-NET1 Wireless Network Configuration.

   Similarly add client entry for AP2.

2. Add the user **dlink** with password **admin** to the *users* file as:

   ```
   dlink Auth-Type := EAP, User-Password == "admin"
   ```

3. Restart the RADIUS server (you must restart it after you make any changes to the configuration file).

4.5. Verifying the Configuration

6. On Unified Switch 2, click **Monitoring → Access Points → Failed Access Points** and add AP2 to the Valid AP database on Unified Switch 2.
7. From a wireless client, connect to AP1 and verify that you can see the SSIDs for the following:
   - Guest Network
   - D-LINK NET1
   - D-LINK NET2
8. Connect to D-LINK-NET1 from a wireless client to verify that WPA2 authentication is required.
9. After connecting, check the IP address that the switch DHCP server assigned.
10. Start the Roaming Test.

4.6. Testing the L3 Authenticated Roaming Feature

4.6.1. Simulated Roam via Power Down of AP

The following procedure shows how to perform an L3 Tunnel roaming test.

1. Use your laptop to test wireless connection by associating to the “D-LINK-NET1” SSID Network, and check if you’re getting the IP address correctly from the Unified Switch’s DHCP server on the Tunnel subnet after properly authenticating via WPA2.
2. Once wireless connectivity is confirmed, you can check which AP your laptop connects to [WLAN/ Monitoring/ Client/ Associated Clients].
3. Start to Ping one of the LAN interfaces (172.17.5.253 or .254) or its loopback interface (192.168.10.254).
4. Disconnect the AP which your laptop is connecting to and see how soon you can roam to the other AP. Normally 1 ping loss is observed when roaming. You will also observe that the client will not re-authenticate with the RADIUS server further decreasing the necessary roam delay (**Note:** this action requires client support). (**Note:** Please see section 3.6.1 below for an alternative mechanism for simulating a roam)

5. You can repeat step 2-4 and observe your laptop roam from AP to AP without changing IP, and with limited packet loss. (**Note:** If you use this method for simulating a roam, when you roam back to the original AP the client was associated with a re-authentication with the RADIUS server will be required since power-cycling the AP will cause it to lose its security key cache.)

4.6.2. Simulated Roam via Disabling Radios

The following procedure shows how to simulate a roam by disabling the radio the client is currently associated with. By using this method, the link between the AP and the Unified Switch will not go down and therefore the local route will not be removed and the above mentioned routing loop issue will not happen.

7. Use your laptop to test wireless connection by associating to the “D-LINK-NET1” SSID Network, and check if you’re getting the IP address correctly from the Unified Switch’s DHCP server on the Tunnel subnet after properly authenticating via WPA2.
8. Once wireless connectivity is confirmed, you can check which AP your laptop connects to [WLAN/ Monitoring/ Client/ Associated Clients].
9. Start to Ping one of the LAN interfaces (172.17.5.253 or .254) or its loopback interface (192.168.10.254).
10. Enable AP “debug” mode to allow direct Telnet access to the APs CLI [WLAN/Administration/AP Management/Advanced].
11. Open a Telnet session to the IP address of the AP which your client has associated with and login.
12. Disable the radios with this command: “set radio all status down”. You will observe the client roam to the other AP with minimal ping loss.

4.6.3. Real Roam

A real-world roam involves physically moving from near one AP to the other such that your client will automatically associate with the closer AP of stronger signal strength. This is best shown when the APs are adequately separated to allow signal strength decrease as you move away one AP and signal strength increase from the other AP as you move nearer. Wireless VoIP phones are the best clients to use since they are tuned to roam if a stronger signal is detected from another nearby AP. PC clients are not tuned for these rapid roams and therefore will often allow the signal strength to decrease significantly before selecting a stronger signal AP to associate with – this can cause traffic loss simply associated with a weak signal. To facilitate the clients decision to roam an antennae can be connected to one of the APs after you have already associated with the other.

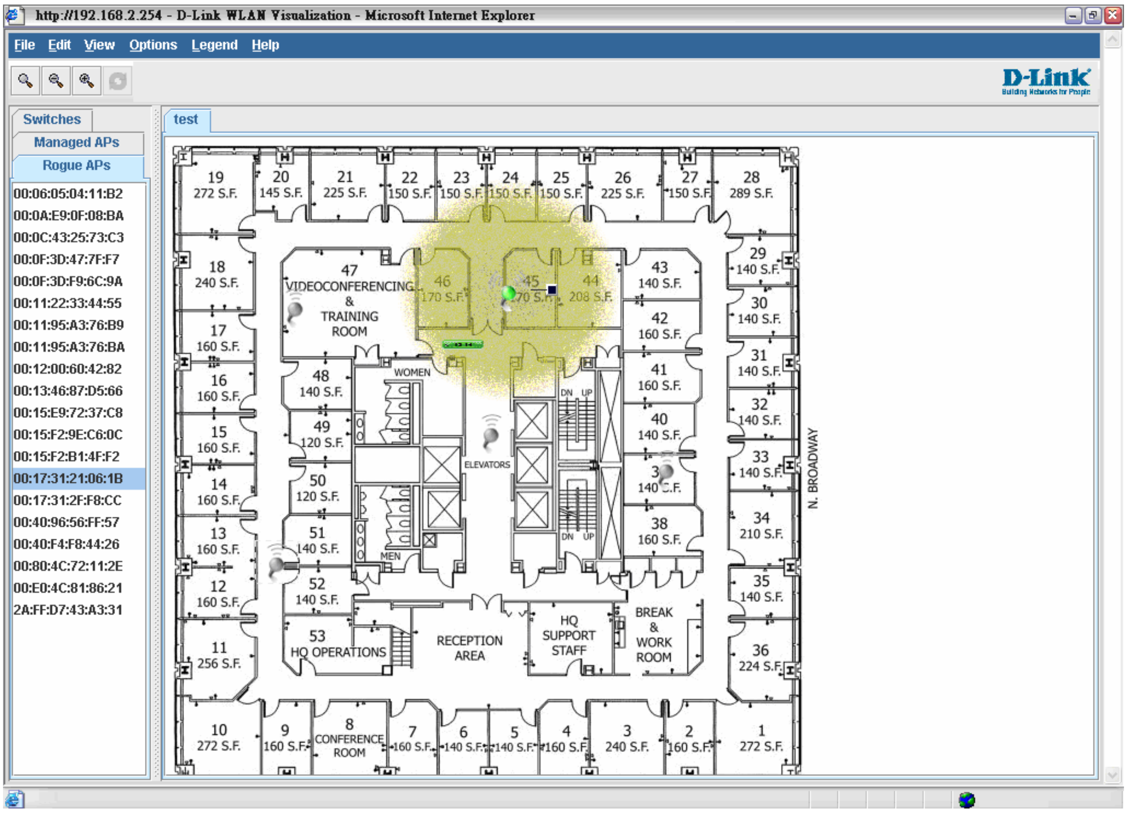
4.7. WLAN Visualization

The WLAN Visualization component is an optional feature that graphically shows information about the wireless network. WLAN Visualization uses a Java applet to display D- Link WLAN Controller Switches, D- Link Access Points, other access points, and associated wireless clients. The WLAN Visualization tool can help you visualize where the APs are in relationship to the building.

You can upload one or more custom images to create a background for the graph. Then, you place the WLAN components discovered by the switch on the graph to help provide a realistic representation of your wireless network. From each object on the WLAN Visualization graph, you can access information about the object and links to configuration pages on the Web interface.

WLAN Visualization can help administrators do the following:

- Track how managed APs are deployed graphically
- Monitor the wireless network status via the dynamic updated diagram.
- Access visual information, such as how APs are placed, how many clients are associated to a certain AP, and where rogue APs are located graphically.



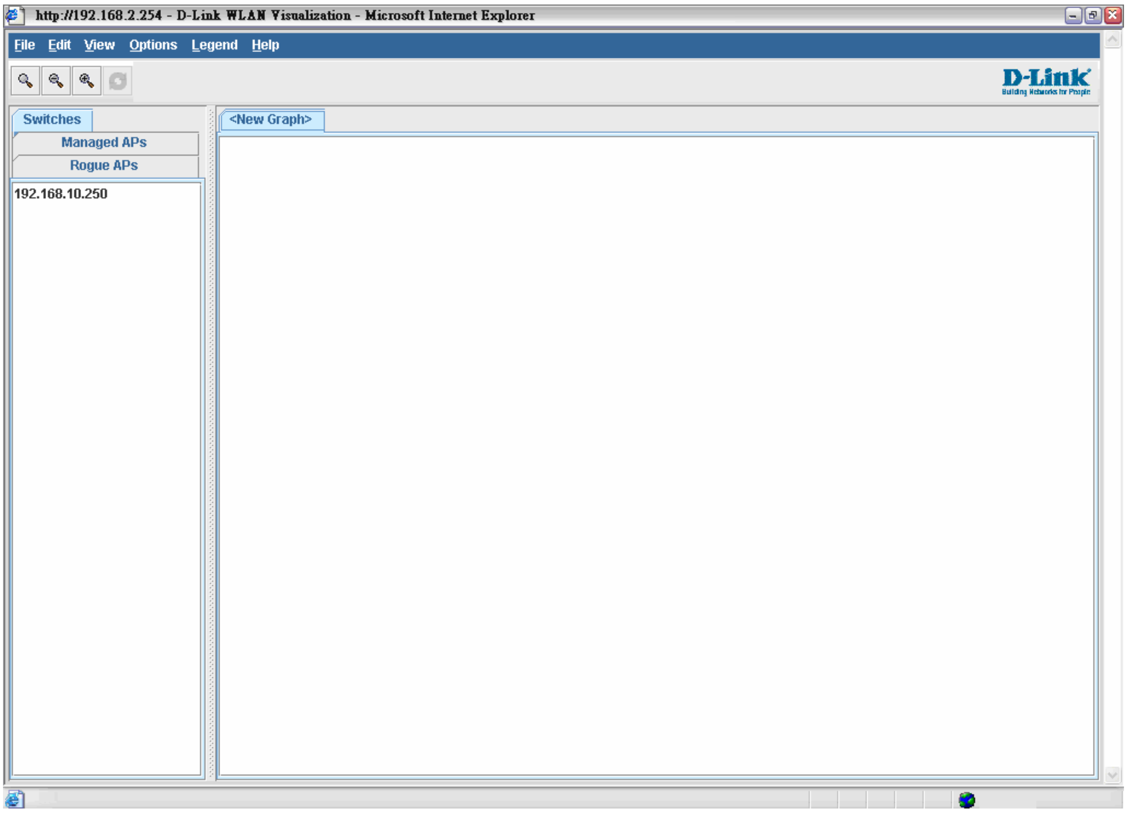
00:06:05:04:11:B2
00:0A:E9:0F:08:BA
00:0C:43:25:73:C3
00:0F:3D:47:7F:F7
00:0F:3D:F9:6C:9A
00:11:22:33:44:55
00:11:95:A3:76:B9
00:11:95:A3:76:BA
00:12:00:60:42:82
00:13:46:87:D5:66
00:15:E9:72:37:C8
00:15:F2:9E:C6:0C
00:15:F2:B1:4F:F2
00:17:31:21:06:1B
00:17:31:2F:F8:CC
00:40:96:56:FF:57
00:40:F4:F8:44:26
00:80:4C:72:11:2E
00:E0:4C:81:86:21
2A:FF:D7:43:A3:31

Before launching WLAN visualization tool, you need to upload a floor plan image file to Unified Switch first. It can be done by selecting the WLAN tab from the navigation panel and traversing down to **Administration → WLAN Visualization → Download Image**.

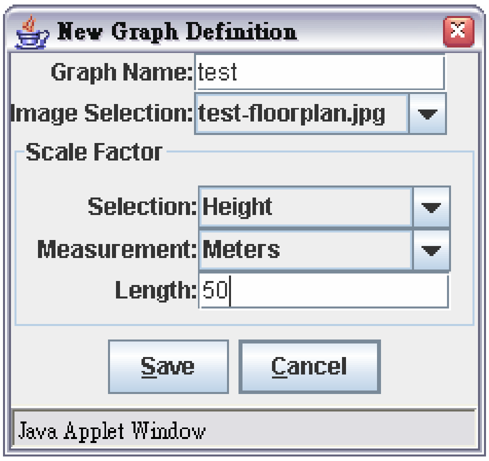
Note:

1. There's a sample floor plan image file in CD for your test, and it's 'test-floorplan.jpg'.
2. When you try to upload your own floor plan image file to Unified Switch, it's recommended the file size is smaller than 150KB.
3. **The RF power displayed in this tool is only for reference, and it is not intended to reflect the real RF status 'cause that requires the input of materials of office blocks and walls or ceilings and complex computing and simulation accordingly.**

The Network visualization can be launched by selecting the WLAN tab from the navigation panel and traversing down to Administration -> WLAN Visualization -> WLAN. When you first launch this tool, you'll see a blank one as below.


http://192.168.2.254 - D-Link WLAN Visualization - Microsoft Internet Explorer
File Edit View Options Legend Help
D-Link
Building Networks for People
Switches
Managed APs
Rogue APs
192.168.10.250
<New Graph>

Then go to 'Edit' and select 'New Graph', and you can input the following then press 'Save'



Graph Name: test

Image Selection: test-floorplan.jpg

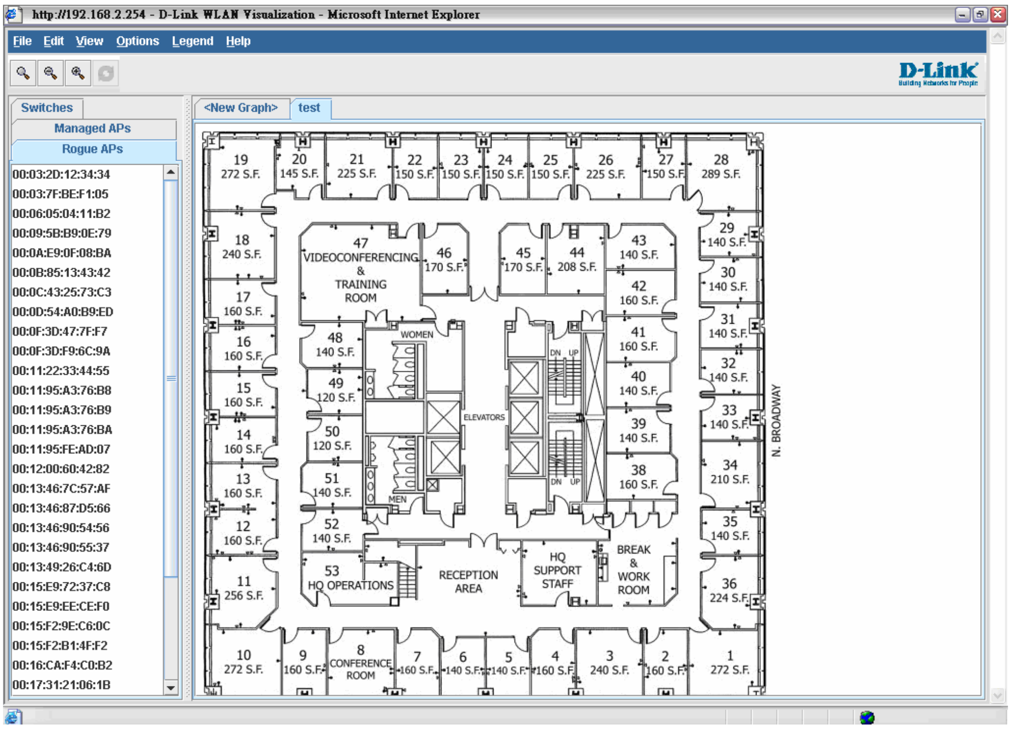
Scale Factor

Selection: Height

Measurement: Meters

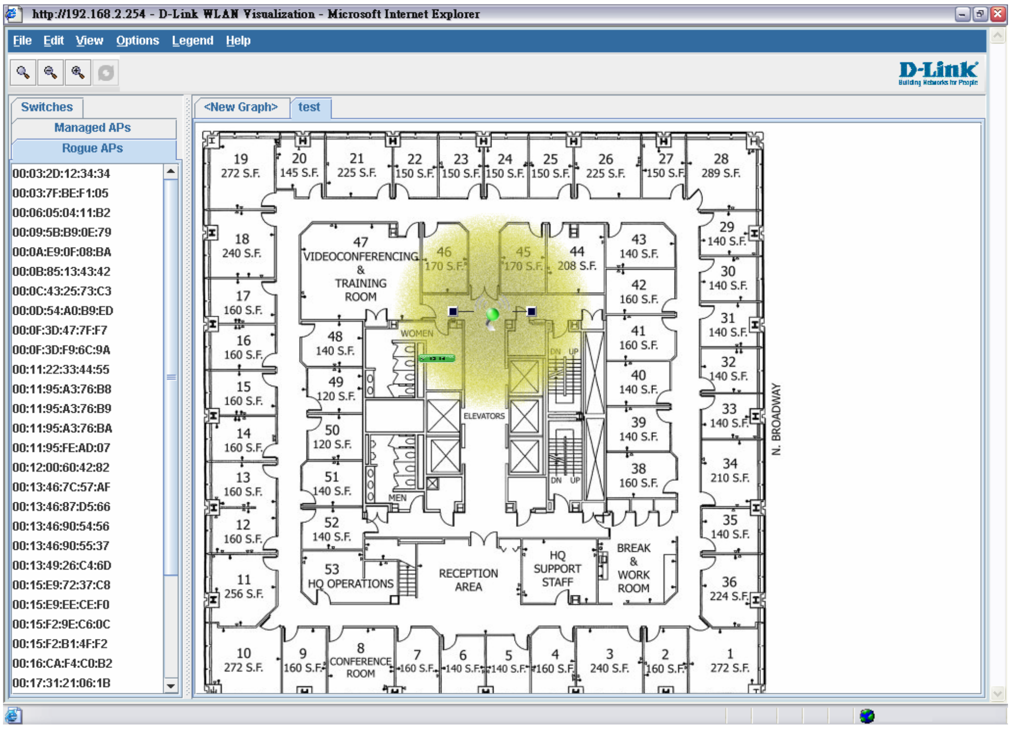
Length: 50

After above, you should be able to see the following



```
00:03:2D:12:34:34
00:03:7F:BE:F1:05
00:06:05:04:11:B2
00:09:5B:B9:0E:79
00:0A:E9:0F:08:BA
00:0B:85:13:43:42
00:0C:43:25:73:C3
00:0D:54:A0:B9:ED
00:0F:3D:47:7F:F7
00:0F:3D:F9:6C:9A
00:11:22:33:44:55
00:11:95:A3:76:B8
00:11:95:A3:76:B9
00:11:95:A3:76:BA
00:11:95:FE:AD:07
00:12:00:60:42:82
00:13:46:7C:57:AF
00:13:46:87:D5:66
00:13:46:90:54:56
00:13:46:90:55:37
00:13:49:26:C4:6D
00:15:E9:72:37:C8
00:15:E9:EE:CE:F0
00:15:F2:9E:C6:0C
00:15:F2:B1:4F:F2
00:16:CA:F4:C0:B2
00:17:31:21:06:1B
```

You can start to drag and drop from items from left hand side tab including Switches, Managed APs and Rogue APs. Then you can go to ‘View’ ‘AP Power Display’ and select ‘Show 802.11b/g’, you’ll be able to see the following



```
00:03:2D:12:34:34
00:03:7F:BE:F1:05
00:06:05:04:11:B2
00:09:5B:B9:0E:79
00:0A:E9:0F:08:BA
00:0B:85:13:43:42
00:0C:43:25:73:C3
00:0D:54:A0:B9:ED
00:0F:3D:47:7F:F7
00:0F:3D:F9:6C:9A
00:11:22:33:44:55
00:11:95:A3:76:B8
00:11:95:A3:76:B9
00:11:95:A3:76:BA
00:11:95:FE:AD:07
00:12:00:60:42:82
00:13:46:7C:57:AF
00:13:46:87:D5:66
00:13:46:90:54:56
00:13:46:90:55:37
00:13:49:26:C4:6D
00:15:E9:72:37:C8
00:15:E9:EE:CE:F0
00:15:F2:9E:C6:0C
00:15:F2:B1:4F:F2
00:16:CA:F4:C0:B2
00:17:31:21:06:1B
```

Then you can move your cursor to any of the object and with right click, you can see more detail information of that object like device/RF information.

Appendix

1. You can use the following to make console connection
- Select the appropriate serial port (**COM port 1** or **COM port 2**).
- Set the data rate to **115200 baud**.
- Set the data format to **8 data bits**, **1 stop bit**, and **no parity**. Set **flow control** to **none**.
- Under Properties, select **VT100** for Emulation mode.

2. The CLI commands of DWS-3000 series are more Cisco-Like, default username is ‘**admin**’, and password is none. While you get into the 1st level of system access, the command prompt is “>” (ex. **`(DWS-3024) >`**), and you can use ‘**?**’ command to see what high level system information it can present here. And press ‘space’ or ‘tab’ it will automatically complete the command you’re typing.

3. Use ‘**enable**’ to get into 2nd level of system access, and no default password, so just press ‘enter’. In 2nd level of system access, the command prompt is “#” (ex. **`(DWS-3024) #`**), and you can view all system information with the ‘**?**’ command. Following are some useful ones for listed scenarios:
- **show network**
- **show vlan port all**
- **show ip intereface brief**
- **show wireless ap status**
- **show wireless ap failure status**

4. In 2nd level of system access, you can type ‘**config**’ to get into configuration mode.

5. You can logon to http://pmdap.dlink.com.tw/PMD and to Product Data/ Switch/ Switch/ DWS-3000 Series, to find the latest firmware of Unified Switch as well as AP. Also the manual of Web GUI & CLI for detail reference.

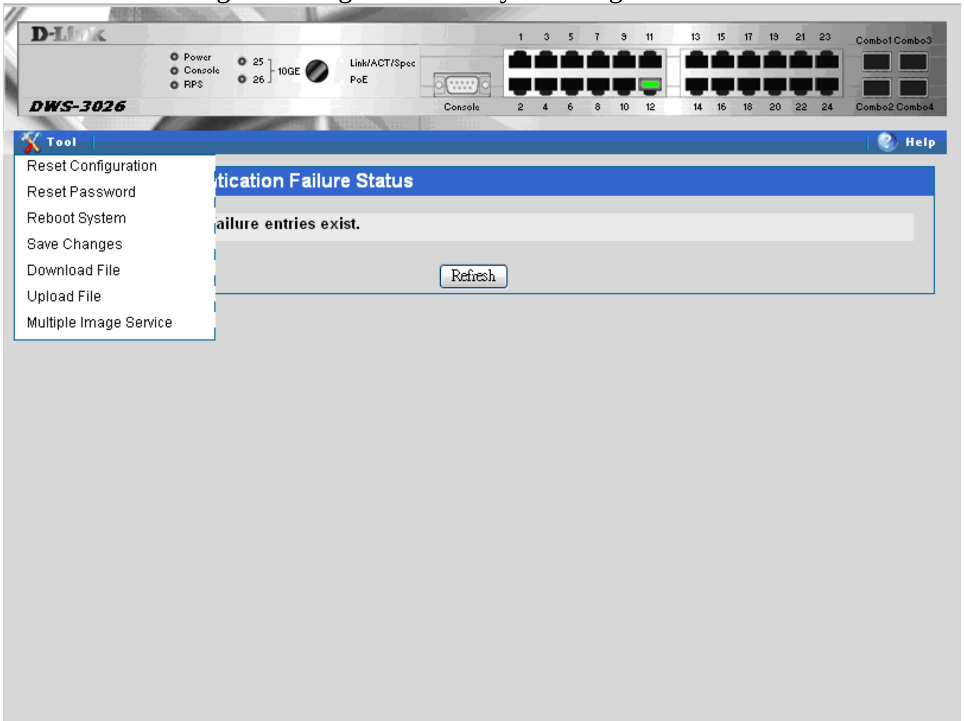
6. When you upgrade the Unified Switch, you need to upgrade Access Point as well. Please refer to the upgrade instruction along with the firmware on PMD.

7. For more information regarding the deployment in the overlay structure, you can refer to the coming white paper on PMD. The white paper will introduce about different deployment topology, and things need to be noticed.

Troubleshooting

1. Several known issues have been identified in the current version, and they'll be solved in the coming release. Those issues include in certain conditions it might not be able to display auto power adjustment.

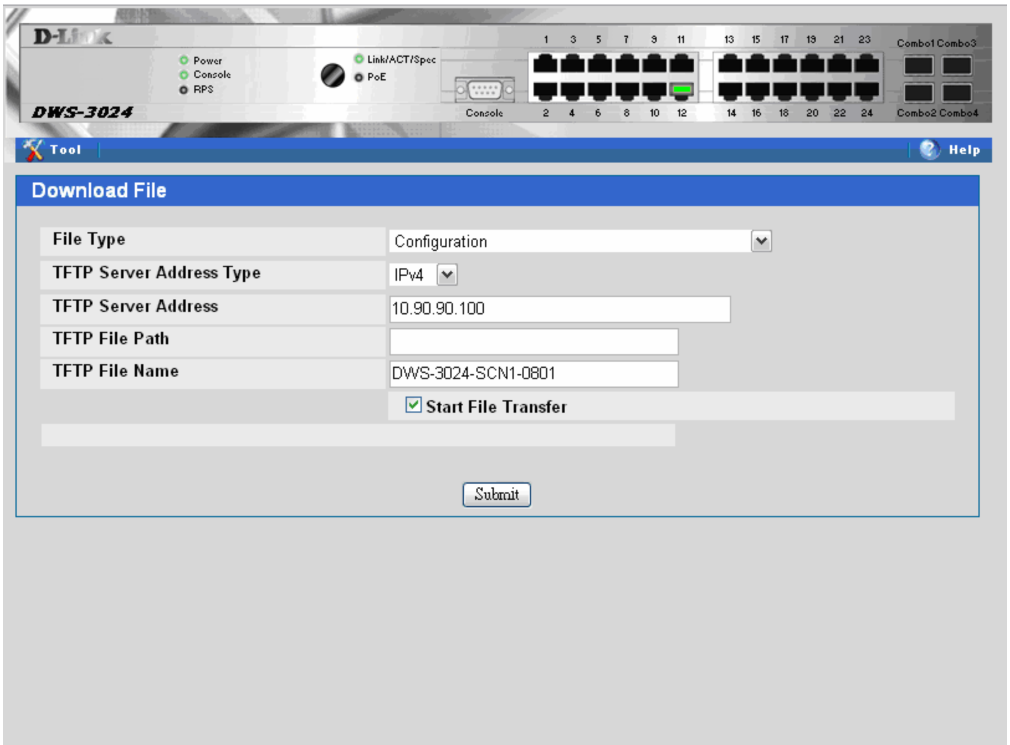
2. In case you can't see the ideal results by configuring manually, we provide the sample configuration for all scenarios (file names are *DWS-3024-SCN1-1018*, *DWS-3024-SCN2-1018, DWS-3024-SCN3-1018, DWS-3024-1-SCN4-1018, DWS-3024-2-SCN4-1018* respectively; two configurations for scenario 4 for 2 Unified Switch) so you can still go on the tests. Downloading the configuration file by selecting "Download File" in the tool bar:



tication Failure Status

ailure entries exist.

Choose "Configuration" for the File Type, input the Tftp Server Address (your PC/Laptop), the File Path (no needed if in the root directory of the tftp server), and File Name. Checking the "Start File Transfer", and click the *submit* button. After successfully downloading, the switch will reboot automatically.



Download File

File Type	Configuration
TFTP Server Address Type	IPv4
TFTP Server Address	10.90.90.100
TFTP File Path	
TFTP File Name	DWS-3024-SCN1-0801
	☑ Start File Transfer